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JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania;

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

EDITED
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WASHINGTON.

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JANUARY, 1832.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

NOTES OF AN OBSERVER *on an opinion respecting the Draft in Chimneys; and on another relating to Inertia, which appeared in this Journal.*

In vol. iii. p. 352, of the Journal of the Franklin Institute, there are some very judicious answers given to some queries on the subject of draft in chimneys. I think, however, the author is wrong in his answer to the 5th question. "Will a chimney largest at the top, or vice versa, make the strongest draft?"

Ans. "As that portion of the column of heated air, &c. nearest the burning coals, must necessarily be more expanded, and require more room than at the top of the chimney, where their temperature and volume are diminished, a chimney largest at the bottom must be better calculated to promote a rapid current through it, than the same chimney with its apex reversed." The reason here given is extremely plausible, but I would not rely on it, without experiment, for the following reasons. First, if the upper part of the chimney is enlarged, the friction will be diminished by the diminished velocity. Second, it is highly probable that elastic fluids flowing through tubes, have their flow increased by expanding tubes—on the principle of Venturi's adjutages. [See vol. iv. p. 282 of this journal. See also experiments of the Institute, hereafter to be published.] Because, from the very nature of inertia, whatever velocity may be generated in the lower part, if contracted, it inclines to preserve the same in the wider part above, and thus to increase the draft.

However this may be, I have one remark to make which will be useful to those whose houses smoke in windy weather, or whose furnaces draw worse in windy weather than in calm.

Let a roof, or inclined plane, be made of tin, or sheet iron, or boards, from the top of the chimney walls, outwards and downwards, at an angle of 45 degrees with the perpendicular walls; extending two or three feet from the top each way, more or less, according to the size of the chimney. With such an arrangement at the top of a chimney, the draft will be greatly increased by a strong wind. The experiment has been tried at the suggestion of the writer of this paragraph, with complete success. The modus operandi is obvious. The more violently the wind blows, the more will the weight of the column of air over the chimney be lifted up by the oblique direction given to it by its striking against the plane; that is, a partial vacuum will be created exactly over the top of the chimney.

It is known that a draft in a chimney may be increased by letting into it highly condensed steam, through a pipe opening upwards: and I have been told by practical engineers, that a greater effect is produced by letting the pipe open low down in the chimney, than near the top.

The reason appears to me to be that the velocity given to the gases in the chimney near the bottom, is nearly preserved throughout its whole extent by the nature of inertia.

It might be curious to inquire, what is the velocity with which air moves upwards in a chimney of a given height, with a given temperature above the air on the outside. Now it is known that if the atmosphere were of a uniform density, equal to that at the surface of the earth, it would be twenty-seven thousand feet high. If a body were to fall freely in vacuo from this height to the earth, it would acquire a velocity of thirteen hundred and thirty feet per second, and this is the velocity with which air would rush, by its own pressure, into a vacuum.

It is also known that the velocity with which fluids are discharged under different pressures, is as the square roots of those pressures; that is, four times the pressure will give double the velocity, and nine times the pressure three times the velocity, &c. If there is pressure both ways, as in the case of one fluid rushing into another, with different heads of pressure, then the velocity will be proportional to the square roots of the differences of pressure. For example, suppose two vessels filled with water, one twenty-seven thousand feet high, and the other sixteen feet higher, and a communication made between these two vessels, either near the top or bottom, the fluid would be discharged with a velocity due to a head of sixteen feet. For the writer of this article demonstrated by experiment, (see this Journal, vol. ii. p. 61,) that water makes no resistance to water issuing under a given head. The same law will apply to the gases; consequently the resistance at the top of the chimney to the issuing air is nothing. If, now, we ascertain how much less air there is in a chimney in consequence of its rarefaction by heat, we shall be able to calculate the velocity with which the external air moves upwards into it, by the following very simple rule—*Multiply the square root of the number of feet which the chimney contains in perpendicular height, less than a column of air of the same height on the outside, by eight, and the product will be the velocity in feet per second with which the air will move* *into the chimney.* Now it is known that air, at the temperature of thirty-two degrees of Fah. has its bulk doubled by an increase of four hundred and eighty degrees of temperature. Suppose, for example, that a chimney is thirty-two feet high, and the temperature of the air on the outside is thirty-two degrees, and the temperature of the air in the chimney, at a mean, four hundred and eighty above thirty-two, then will the quantity of air in the inside of the chimney be only one-half of what it is in a column on the outside of similar height. The difference of head then will be sixteen feet. The square root of sixteen is four, and this square root multiplied by eight, the product is thirty-two, which is the velocity with which the air moves per second into the chimney.

Again, suppose the chimney is eight feet high, and the temperatures as before. Then will the quantity of air on the outside be four perpendicular feet more than that in the chimney. The square root of four is two, and two multiplied by eight is sixteen, which is the velocity of the air passing into the chimney. Again, suppose the chimney to be two feet high, and the temperatures as before, then will the difference of head be one foot, and the square root of one is one, and one multiplied by eight, is eight—the velocity per second, in feet, with which the external air moves upwards into the chimney.

As the temperature of the air on the outside of the chimney is not always thirty-two, it is desirable to know what the volume of such air would be at thirty-two.

It may be obtained by the following rule. First, for temperatures above thirty-two. *Add the number of degrees of Fah. above thirty-two, to four hundred and eighty, and divide four hundred and eighty times the volume of air on the outside of the chimney by the sum, and the quotient will be the volume of air at the temperature of thirty-two.* Again for temperatures below thirty-two. *Subtract the number of degrees of Fah. below thirty-two from four hundred and eighty, and divide four hundred and eighty times the volume of air on the outside of the chimney by the remainder, and the quotient will be the volume of air at the temperature of thirty-two.*

As we have now before us data for calculating the velocity with which air rushes into a chimney at any temperature without and within, we will illustrate the rules by one more example. Let the chimney be 32 feet high, and the temperature on the outside be 60 degrees above, and in the inside 480 degrees above 32. Now let 480 times 32 be divided by 480 added to 60, and the quotient will be $28\frac{4}{10}$ feet, the column of air on the outside at the temperature of 32. Again, let 480 times 32 be divided by 480 added to 480, and the quotient will be 16 feet, the column of air in the inside of the chimney at the temperature of 32; therefore, the difference of the heads of pressure in this case is 16 subtracted from 28.4, which is 12.4.

If, now, according to the rule given above, the square root of 12.4 be multiplied by 8, the product will be $28\frac{17}{100}$ feet, the velocity with which air at a density due to the temperature of 32, will flow into a chimney at the above temperatures.

In these calculations no allowance is made for friction along the sides of the chimney, and in passing through the fuel at the entrance. Neither has any notice been taken of the fact that the gases which pass up the chimney, after having performed the office of combustion, are always of greater weight than the air which enters.

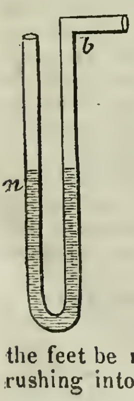
Even when pure dry carbon is the fuel, if all the oxygen of the air which enters, unites with it, the gas which ascends in the chimney is seven and a half per cent. heavier than the air which performs the combustion; and this alone will always diminish the velocity of the entering air more than seven and a half per cent, for that much more matter has to be put in motion with a velocity greater than that of the entering air.

If wet materials are used for combustion, the diminution of velocity will be much greater.

It will be seen from the above examples, that a chimney thirty-two feet high, gives a velocity only double that of one which is one-fourth as high, and only four times greater than that of one which is one-sixteenth as high. And in general the velocity of air moving up chimneys of different heights, with the same mean temperatures, neglecting friction, is as the square roots of their heights.

These calculations are all made on the supposition that the chimney is of the same diameter throughout. The writer believes the draft would be increased below if the chimney should be widened out a little above the fire; but the exact form, best suited to produce the greatest effect, must be ascertained by experiment. This much may be said, that if the object should be to burn as much coal as possible in a chimney of a given height and diameter, so as to produce the most intense heat possible by a natural draft, the chimney should be of a shape somewhat like Venturi's adjutage, with the fire in the "contracted vein."

If the principles explained above are clearly comprehended, it will be extremely easy to understand another method of ascertaining the velocity with which air rushes up a chimney at any moment, which I now proceed to explain.



Let a tube of glass, of any convenient diameter, of equal bore throughout, be bent as in the adjoining figure, so that its two legs may be parallel, and one of them, near the top, be bent at right angles, as at *b*. If, now, these two legs be filled to a certain height, *n*, with water, care being taken to keep the legs vertical, and the end *b*, thrust into the chimney just above the fire place, the water will rise in the leg *b*, and sink in the other. Now as water is 800 times heavier than air, if the difference of the heights of the water in the two legs be multiplied by 800, it will give the head of pressure of air on the outside of the chimney above that within.

If this be reduced to feet, and the square root of the feet be multiplied by eight, it will give the velocity of the air rushing into the chimney as before. Suppose the difference of the height of the water in the two legs is four-tenths of an inch; 800 times four-tenths of an inch is $26\frac{66}{100}$ feet, and the square root of this, multiplied by 8, is 41 feet; which is the velocity with which air rushes into the chimney where the leg of this anemometer is inserted.

As the method by the anemometer gives the actual velocity, free from the uncertainty of friction in the chimney, it will be superior to the former, if no uncertainty should arise from the difficulty of measuring the depression of water in the tube.

I am aware that these calculations are founded principally on theoretical principles, and that they give a velocity about one-sixth greater than Dr. Hutton's experiments on the impulse of air in motion, which appears to me to be the converse of the principles calculated above; yet as experiments differ very widely among themselves, so as to leave great doubt on the subject, and as my calculations are founded on acknowledged principles, I do not hesitate to present them to the readers of the Journal of the Franklin Institute.

In vol. iv. p. 34, there is an essay by Thomas W. Bakewell, Esq. a gentleman who discovers much acuteness of mind on various subjects discussed by him in this journal, which, for that very reason, is the more deserving of notice, since the weight of his authority, if uncontradicted, might with many be considered sufficient to subvert a doctrine which has been universally admitted among philosophers as resting on the immoveable basis of demonstration.

The chief object of the essay under consideration is to show that inertia varies with gravitation. The author says, "If a hundred pound ball were taken to such a distance from the earth as should lessen the attracting force, or weight, to one pound, it would have lost 99 per cent. of its weight or attracting quality, and also 99 per cent. of its impeding quality, inertia, and would therefore be in exactly the same situation as a ball weighing one pound is, when sixteen feet from the earth, and would consequently fall from this point, in one second of time."

Now this is mere hypothesis, and is besides contrary to known facts. For instance, if the author will put himself to the trouble to calculate how far the moon deviates from a tangent to her orbit in one second of time, he will find that instead of falling below it sixteen feet as his doctrine requires, she falls only $\frac{1}{3600}$ of sixteen feet, the exact distance she should fall on supposition that her inertia is undiminished by her removal from the earth's centre sixty times as far as a body at the surface of the earth, where it is known by experiment she would deviate from a tangent sixteen feet in a second of time, provided she weighs only one hundred pounds. For if the received law of gravitation is correct, and Mr. Bakewell seems to admit it, then the gravitation of the moon to the earth, is only $\frac{1}{3600}$ of what it would be if she was at the earth's surface; that is, sixty times as near the centre of attraction; for sixty times sixty is thirty-six hundred.

If Mr. Bakewell is not satisfied with this single fact, which appears to me decisive, let him calculate how far the several planets fall below a tangent to their orbits in a second of time, and he will find they fall exactly as far as they should do, on supposition that their inertia is neither increased nor diminished by gravitation. The method of making the calculation, a demonstration of which is given in *mechanics*, is the following—*Multiply the number of feet which a planet moves in its orbit in one second of time, by itself, and divide the product by the diameter, in feet, and the quotient will be the number of feet which the planet deviates from a tangent in a second.* It will be found, by calculating according to this rule, that the deviations from the tangents of the orbits of all the planets, are inversely as the square of their distances from the sun.' Now if Mr. Bakewell's doctrine is true that inertia is always in proportion to gravitation, these deviations from the tangents should be equal in all the planets in equal times. For he says, " if we suppose the attraction of the earth should be increased a hundred fold, the velocity of a ball, falling sixteen feet, would not be increased or changed, because the inertia, or impeding power, would also be increased at the same rate, and therefore under every degree of gravitating force, or whatever may be the quantities of matter contained in the bodies acted upon by it, the velocity with which they obey it, is as the rule for falling bodies near the earth, sixteen feet the first second," &c.

Again he says, "if the earth were divested of the motion in its orbit round the sun, and, consequently, of its centrifugal force, it would fall to that body under the same law, and commence its career at the same rate that an apple falls from a tree, viz. sixteen feet the first second, &c." For the sake of testing the correctness of this opinion, as well as illustrating the rule given above, let us actually calculate how far the earth deviates from a tangent to its orbit in one second of time; for this is the exact distance it would fall towards the sun in one second, if its projectile force were destroyed. Suppose its distance to be ninety-six millions of miles; its orbit then will be 3.1416 times twice 96,000,000 = 603187200 miles nearly. This multiplied by 5280, the number of feet in a mile, gives 3184828416000 the number of feet in the earth's orbit. This number again being divided by 31557600, the number of seconds in a year, gives 100921 feet, nearly, for the distance the earth moves in her orbit, in one second of time. The square of this last number, that is, the number multiplied by itself, is 10185148241 and this divided by 1013760000000, the number of feet in the diameter of the earth's orbit, gives .01004 feet, the distance which the earth would fall towards the sun in one second, if her projectile motion were destroyed. That is, she would fall but little more than one-ninth of an inch, instead of sixteen feet.

By calculating in a similar manner the distance which Herschell falls from the tangent of his orbit in a second, by the force of the sun's attraction, it will be found to be nearly 361 times less than that of the earth, for Herschell is nearly nineteen times further from the sun than the earth, and 19 times 19 is 361.

Mr. Bakewell says, "a friend of mine thinks that the tides make against my theory; for if the waters on the earth are at all influenced by the moon's attraction, they ought to fall to it at once."

I agree with this friend, and I think if Mr. Bakewell examines again what he has written in answer to this objection, he will find he has said nothing to show the possibility of there being a tide on the opposite side of the earth from the moon.

Indeed some of the consequences of Mr. Bakewell's hypothesis are so evidently absurd, that I cannot imagine how it could have been entertained for a moment by a gentleman who, in some of his subsequent essays, manifested a very acute mind.

For example: If there were only two bodies in the universe, one indefinitely large, the other indefinitely small; for instance, the sun and a grain of sand; by this hypothesis they would fall towards each other with equal velocities, and would move the same distance the first second, when placed one thousand millions of miles apart, as if they were separated only one hundred yards.

According to Kepler's law, which is not hypothetical, but derived from patient observation, the squares of the periodic times of all the planets round the sun are as the cubes of their distances: according to Mr. Bakewell's hypothesis, the periodic times would be as the square roots of the distances. Again, from Kepler's law it is known that the velocities of the planets in their orbits is *inversely* as the square roots of their distances: whereas, by Mr. Bakewell's hypothesis the velocities would be *directly* as the square roots of their distances. Let us take one example. Suppose a planet four times as far from the sun, as the earth, and suppose, according to the hypothesis, it falls from a tangent to its orbit, the same distance as the earth falls, it may be shown by geometry that it must move twice as far in its orbit to be the same distance from the tangent as the earth is, in the same time, which moves in a circle four times less.

In like manner it may be shown that if a planet is nine times as far from the sun as the earth is, it will have to move three times as far in its orbit, to be removed the same distance from the tangent, at the end of a second, as the earth is. Now, according to the law which actually exists in nature, the earth moves three times as fast as a planet which is nine times as far from the sun as itself: whereas, according to the hypothetical law we are examining, the planet would move three times as fast as the earth.

If this article should be successful in freeing an active and ingenious mind from the trammels of a false hypothesis, on a subject of high importance, it will not have been written in vain.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

NOTES OF AN OBSERVER *respecting the centrifugal force of a body revolving in a given circle.*

In the 5th volume of the Journal of the Franklin Institute, page 52, is the following question—" What is the absolute centrifugal force of a given body, revolving in a given circle, with a given velocity?"

The answer there given is correct, with the exception of 16½ being used for $16\frac{1}{12}$. The general reader, however, who is unacquainted with algebraic notation will find the following method of calculating centrifugal force more intelligible.

In mechanics it is demonstrated that if a body moves in a circle, sixteen feet in diameter, with a velocity of sixteen feet per second, its centrifugal force is just equal to gravity; that is, its centrifugal force is equal to its own weight.

It is also shown that the centrifugal force is directly as the square of the velocity, and inversely as the diameter of the circle in which the body moves. From these principles the following very simple rule is derived. *Multiply the weight of the body in pounds by the square of the number of feet passed over in a second of time, then divide the product thus obtained by sixteen times the diameter of the circle in feet, the quotient will be the absolute centrifugal force in pounds.*

For example, "Let one of the balls of a governor of an engine, weigh thirty pounds; and suppose that it revolves in a circle the diameter of which is three feet, in one second of time." Here the number of feet passed over in a second is first obtained by multiplying the diameter by 3.1416, because the circumference of any circle is 3.1416 times greater than its diameter; but three times 3.1416 is 9.42, which is the velocity in feet per second; now square 9.42, and the result will be 88.54. This square being multiplied by 30, the weight of the ball, gives 2656.2. Now divide this quantity by sixteen times the diameter, $16\times3=48$, and the quotient will be 55.33 pounds, the centrifugal force.

If the reader wishes to become familiar with the laws of centrifugal force, let him propose to himself a number of such questions as the following; and first, let the velocity be constant, for example, sixteen feet per second.

What will be the centrifugal force of the ball mentioned above, weighing 30 pounds, in circles of the diameters 16 feet, 32 feet, and 64 feet. He will find the answer to the first question will be 30, to the second 15, and to the third $7\frac{1}{2}$.

Let him then vary the velocity, keeping the diameter the same; for example 16 feet. What will the centrifugal force be with the following velocities, 16 feet per second, 32 feet per second, and 64 feet per second? He will find the respective answers to be 30 pounds, 120 pounds, and 480 pounds. He may then proceed to vary both the circle and the velocity. For example, if the diameter is 4 feet, and velocity 8 feet, he will find the answer to be 30 pounds, or equal to gravity. If the diameter is one foot, and the velocity four feet per second, the answer will be 30 pounds. If the diameter is one foot, and the velocity is eight feet, the answer will be 120 pounds.

By considering the velocities with which pendulums move at their lowest point, in connexion with the above principles, I discovered the following curious law. *If any pendulum oscillates in an arc of a circle, whose cord divides radius into two equal parts, its centrifugal force at the lowest point is just equal to gravity.* In other words, if any pendulum be drawn out of the line of direction until its perpendicular height above its lowest point shall be one-half its own length, then will the tension of the cord by which it is suspended at this lower point of oscillation be just twice as great as when the pendulum is hanging at rest. This law may be tested by as many examples as the reader pleases. I shall propose two. Suppose a pendulum two feet long drawn up the arc of its circle, until its perpendicular height is one-half its own length; in oscillating it will descend one foot in perpendicular height. Now it is known from the laws of falling bodies, that in falling freely one foot perpendicular height, either in the line of direction, or on an inclined plane, or in a curve as of a pendulum, it will acquire a velocity of eight feet per second, and according to the rules mentioned above, if a body moves in a circle four feet in diameter, with a velocity of eight feet per second, its centrifugal force will just equal gravity. Suppose now the pendulum is eight feet long, and let it be drawn till it is four feet above a line drawn horizontally through the lowest point of the curve. Now this pendulum moves in an arc of a circle which is sixteen feet in diameter, and at its lowest point, according to the laws of falling bodies, its velocity is 16 feet per second, and with such a velocity, and such a circle, its centrifugal force will be found to be equal to gravity.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Description of an improvement in the mode of Balancing Mill Stones.

Sir,—I offer the following improvement for your consideration, and if you think it worthy, you will please publish it in the Journal of the Franklin Institute. It consists of an alteration in the balance rine and driver, for balancing the running mill stone, obviating the necessity of taking up the stone to remove the rine, and afterwards adjusting the driver so that each prong shall have its full bearing; which improvement will also obviate the necessity of taking out the spindle to adjust and fix the rine and driver as heretofore.

I take a common three pronged balance rine, such as is commonly used, then I rivet, or otherwise secure, a three-cornered box on the under side of the top of said rine, so that each corner may rest on the under side of each prong. On each side of this box I fix a set screw, to act on a small block of iron, steel, or other metal, with a centre hole punched in it to admit of the cock head, or upper end of the spindle to rest in. This small block, by working the screws, will move the running stone, and admit of balancing it on the head of the spindle to any nicety; after the runner is well balanced I apply a sufficient force to the wallower on the spindle to bring up the driver to its bearing. Then I take a common three-pronged driver, and fix each prong askew, so as to stand square with the prongs of the rine on the driving side, then the prongs being no longer than the size of the eye of the mill stone, and when fixed on the spindle the lower side of driver and rine being of an equal distance from the face of the bed stone, I insert, through the driver, on each prong, a set screw to work against each prong of the rine, and to set the said screws. After the runner is well balanced, I apply a sufficient force to the wallower, on the spindle, to bring up the driver to its bearing; then, with a wrench, I screw up the screws that are wanting to come up to the prong of the balance rine, each to a full bearing, so, as I have before stated, that the runner can be justly balanced, and the driver set to its proper bearing, without any cause of taking out the spindle. I have had one in operation some time, on the above principle; it more than answers my anticipations.

Yours, respectfully,
DANIEL LAMB.

Almonissôn Mills, near Woodbury, N. J. July, 1831.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Practical Observations on the good and bad properties of the colours used by artists. *By* JOSHUA SHAW.

Philadelphia, December 28, 1831.

SIR,—Having, in the way of my profession, and by long experience and practical experiment, made myself acquainted with the good and bad qualities of the colours in general use with artists, I am inclined to believe that the results, if made public, would be found of much interest to the profession, as well as to connoisseurs and lovers of the art in general; and believing the Journal of the Franklin Institute to be a useful and legitimate channel through which to furnish the information, I submit the first of a series of remarks, or essays, which I have in contemplation, to your inspection, and which, if approved of, you will please to lay before your readers. You are not to consider my observations as the result of *chemical* experiment in the laboratory, of which an artist, generally speaking, can be expected to know but little; about as much, perhaps, as a chemist generally knows of painting. I pretend to very little knowledge of the art of manufacturing colours, and shall confine myself to their application upon canvass, their disposition to change, or such other qualifications as may render them valuable or otherwise. My limited knowledge of science as applied to chemistry, or to books, does not enable me to say whether I am in the track of any predecessor or not; but it is a fact as plain to me as noon day, that there is an unaccountable difference between the productions of the ancient and modern artists; I speak with reference to colours themselves, and the modes of their application, without the most distant idea of contrasting those merits which belong to composition or design, for in this respect, the balance is certainly with the present generation, notwithstanding any thing which may be said to the contrary by the affected babbling connoisseur, who in every age has been the same dissatisfied malcontent, decrying living merit.

I shall commence with remarks on blues, and the following, together with the preceding observations, may be given together as constituting the first division of my undertaking.

Prussian blue is a combination of oxide of iron with cyanogen, upon an aluminous base. It is the most common blue in use among artists, and from whom, owing to long acquaintance with it, there seems to be but little chance of an immediate separation—such is the force of habit. Prussian blue is an intensely deep pigment, and cheapness alone must have been the principal cause of its general adoption; however, few, or none, will envy the feelings of the artist who, on that account, shall continue to use it; his reputation must soon suffer from its liability to change, and the penalty thus incurred will be of infinitely greater disadvantage than any difference of price between it and other materials of a more permanent nature. In large compositions, and in portraits, where broad draperies are required, it may be employed to some advantage, if employed in the following manner—it should be reduced with white, and in every part left much lighter than intended to be when finished, and when dry, increased to the proper depth by a thin coat or glazing of Antwerp or fine cobalt blue, by which means it will be protected from the effects to which it otherwise is liable when in contact with atmospheric air, from which it suffers materially, changing by degrees to a dirty olive green. I know not upon what principle this change is effected, but I speak of results, and leave the causes to be explained by those who know more of chemistry than I do.

Its intensity and heaviness are equally against it, and, if there were no other, these should furnish sufficient objections for continuing its use. The least skilful in art, as well as the genuine connoisseur, must have observed in all the works of the old masters, whether good or bad, that all their deeper tones are clear and transparent, and if so after the lapse of a century, it is certain they were equally so when they left the easel of the painter.

With respect to the greater proportion of the works of modern artists, it is evident that their pictures are as remarkable for qualities of a contrary nature, and it may be generally traced to their slovenly disregard as to the purity, or other good or bad qualities, inseparable from the colours they employ.

I shall now dismiss the article of Prussian blue as a totally worthless colour when applied to the fine arts, to make room for a few observations respecting the properties of indigo, the which, although it does not properly fall under the head of the present article, I shall take this opportunity to introduce, as I do not intend to make it the subject of a separate essay. Indigo, I have always been inclined to believe, possessed many superior qualities, and that it would, sooner or later, become a substitute for, and altogether supersede the use of, Prussian blue. It is laid down as a principle by artists generally, that the durability, as to colour, of vegetable preparations, is not to be depended upon; nevertheless, it is a fact, that lake, prepared from madder, is the best and most permanent of all others—why, then, should we despair of indigo? As an article of commerce, it has never been offered in a pure state, and if any experiments have been made upon it by artists, and have ended in disappointment, I think it must be attributed to the fact, that it contains much of foreign and unfriendly alloy.

The blue vat of the dyer contains indigo deoxidised by protoxide of iron, and rendered soluble, in its yellow green state, by lime water. If a portion of this solution be exposed to the air in a shallow vessel, the indigo will speedily absorb oxygen, and be precipitated in its usual state of an insoluble blue powder; this being dried and digested in a mixture of alcohol and muriatic acid, becomes pure indigo, by the abstraction of all the resin and lime contained in it. Thus prepared, it is a fine powder, intensely deep, but soft and tender in its tint, resembling ultramarine, and does not change when exposed to the air. There is but little doubt that if *pure indigo*, prepared as above, or in any other way more convenient to the chemist, was procurable at the colour stores, it would be found to be a most valuable substitute for the preceding article; for if it will stand the action of light and air, as it certainly does, unprotected by an oily or mucilaginous matter, it would be an acquisition to the palette of no ordinary kind, and prove the most valuable of all other blues when prepared in cakes for wash drawings, and for the use of miniature painters. It is well known that vegetable productions, when they can be depended upon, are, in most instances, preferable to minerals; as applied to water colours they certainly are; they flow freer from the pencil, are more vivid and more convenient to manage.

I am, &c.

JOSHUA SHAW.

Note.—If, in the course of my intended remarks, I should be induced to refer occasionally to known pictures, for the sake of making comparisons, and thereby enabling the painter to form his own judgment as to the truth of my observations, it is trusted that no one will take offence. The sole object of these essays is to improve the condition, and not to traduce the standing of the fine arts at home or abroad, my remarks will be general, and apply alike to every country.

FRANKLIN INSTITUTE.

Explosions of Steam Boilers.

Continued from vol. viii. p. 388.

(No. XIV.)

Extract of a letter from the Hon. S. D. Ingham, late Secretary of the Treasury, dated October 21, 1830.

I send you herewith a drawing of a boiler intended to prevent the possibility of the upper zone being heated above the temperature of boiling water, with a simple apparatus for announcing to the *crew of the boat*, the successive depression of the water. I submit it for your inspection and criticism, and would be gratified if an experiment could be made by constructing two small boilers, one on this plan, omitting the float and bell as unnecessary for this object, and one in the usual form of a high pressure boiler, made of metal one-eighth, or one-fourth, stronger than the first, in all other respects as much alike as possible; then place them side by side in a furnace so constructed as to avoid all danger to the attendant, allowing the fire to surround them freely, and force it until they explode; several gauge cocks in each would be necessary to regulate the height of the water, which should be kept as equal as possible. The *water-guard*, as I have termed it, having no pressure on it, could be kept full with a very simple apparatus; and the supply to the boilers could be thrown in with a small forcing pump. The idea of thus surrounding the boiler with an effective nonconductor, was suggested by reading some of the papers of Mr. Perkins, and a commentary upon his experiments by Mr. Arago; but the remedies proposed by the latter appear to be rather auxiliary than effective, and generally liable to the objection that they depend for success upon a degree of care and attention on the part of the engineer, which is scarcely to be expected, or even within the reach of hope in our country. It will certainly be safer to put it out of the power of the engineer to heat the upper part of the boiler to a temperature above that of the water, than to rely upon any precautions, which depend on his care and constant attention, to regulate it by any standard that can be devised. I would not, however, dispense with the safety valves; they should be constructed in the most perfect manner, and their efficiency will be no longer doubtful when the boiler is so constructed that the elasticity of the steam must always correspond with its temperature; this point being secured, the chief remaining danger will be from raising the ordinary steam too high for the strength of the metal; the safety valve, properly constructed and secured, is perhaps the best remedy for this.

Specification of an improvement on the steam boiler, intended to prevent the explosion of steam boilers, by reason of the great heat in that part of the boiler which is above the water line; and also to give notice of the depression of the water, by the ringing of a bell.

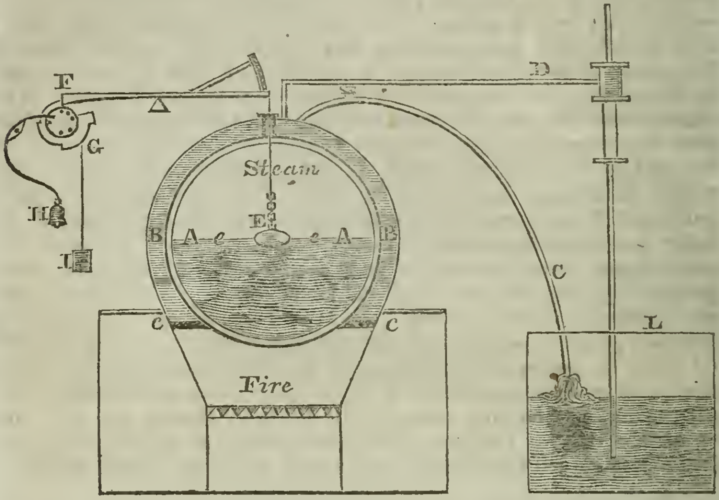
A, A, The steam boiler filled with water to the line *e*, *e*.

B, B, A column of water on the outer side of the boiler, called a water guard; it is confined by a casing of common sheet iron or copper, around the upper and middle parts of the boiler, meeting the fire at *c*, *c*, and leaving a space of 2½ inches between it and the boiler for the thickness of the column of water. This water being exposed to the atmosphere, cannot be heated above 212°, and extending so far below the surface of the water within the boiler, that no part of the iron which has not water in contact with it, shall be exposed to the fire, guards the upper and middle parts of the boiler from the intense heat communicated through the brickwork.

C, A pipe to discharge the overflowing water into the supply cistern L.

D, A pipe and pump to supply the water guard.

E, A concave spheroidal metallic ball, or float, so adjusted as to float as in the drawing where the water is at *e*, *e*. A slight depression of the water raises the catch F, when the lock wheel G, propelled by the weight I, turns until the next notch meets the catch, ringing the bell H; a further depression of the water raises the catch, and the rack wheel turns to the next notch, ringing the bell more actively; a further depression of the water raises the catch above the highest notch, when the weight I runs down, ringing the bell with such violence as should be heard in every part of a steam-boat.



(No. XV.)

Extract of a letter* from Professor James Renwick, of Columbia College, New York, dated

October 27, 1830.

"As relates to that part of the improvement called the water guard: There can be no doubt that it would be certainly effectual in preventing explosions arising from the cause pointed out by Perkins, but there are extremely few cases in which it would be possible to introduce it into practice; the water in the outer vessel boiling under the ordinary pressure of the atmosphere, would not of course be heated beyond 212°, and would carry off the heat of the water and steam contained in the inner boiler so rapidly, that it would be impossible to raise their temperature more than a few degrees above 212°; now, even in the English condensing engines, the safety valve is loaded with three pounds per square inch, and requires steam of a tension greater than could be attained in the proposed apparatus; in our American steam-boats, even when the engine works upon the condensing principle, the safety valve is rarely loaded with less than seven or eight pounds per inch.

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* This letter as well as Mr. Lester's, (No. 17,) was addressed to the Hon. Samuel D. Ingham, (then Secretary of the Treasury,) by whom these extracts were kindly communicated to the committee.

"I am myself decidedly of opinion that no absolute security from explosion can be attained, until a feeding apparatus that shall depend for its action solely upon the level of the water in the boiler, and which is applicable to steam of the greatest tension, shall have been invented, and for this it would be a worthy object to offer a national reward. A small separate engine, working a forcing pump, to which the apparatus which received the prize from the British Society of Arts, would answer the purpose, but there are objections to its use, and it does not fulfil the condition I have stated."

(No. XVI.)

Extract of a letter from the Hon. S. D. Ingham, late Secretary of the Treasury, dated Nov. 1, 1830.

Since I had the honour of addressing you, I forwarded a drawing of the water guard boiler to Professor Renwick, of New York: he considers the remedy effectual against the chief cause of explosion, but is persuaded that the water in the guard will conduct the heat from the boiler so rapidly that the steam cannot be raised within, without great waste of fuel; this objection had struck me with some force in my first speculations on the subject, but had yielded to the consideration that a column of boiling water would not be likely to conduct heat so rapidly from the boiler as the open air at a much lower temperature; how far it would compare with a mass of brick work in this respect, can only be ascertained by experiment. I have supposed that the water guard would be a better non-conductor than the open air, and that if somewhat inferior to the mass of brick work, the defect would be made up by transmitting the escaping heat to the cistern from whence the boiler should receive its supply of water, while all that escaped into the open air or brick work would be lost. In this speculation I may be mistaken, and having great respect for the Professor's judgment, I should be gratified if you would try the experiment, whether a boiler enclosed in the ordinary form, or one with the water guard, require the most fuel to raise the steam. This objection may, however, be readily removed by constructing the water guard strong enough to bear a pressure equal to that which it is proposed to give the steam in the boiler; it will perfectly regulate the temperature of the iron, and its overflowing, which in that case should be constant, will be the admonition to the engineer that all is right. Professor Renwick is of opinion that the best remedy is a constant supply of water, and the desideratum is a contrivance for self-feeding to be continued while the boat stops: believing, as I do, that it is not the mixture of the whole of the water in the boiler with all the steam, I cannot be persuaded that the depression of the water would cause an explosion, if the steam above it had not received an increased heat from the iron, and when the steam is so heated, there may be nearly the same danger when the water is at its proper height.

I enclose an extract (No. 15,) from the Professor's letter that you may consider his objections; whatever comes from him is entitled to great consideration.

(No. XVII.)

Extract of a letter from E. A. Lester, Esq. to the Secretary of the Treasury, dated

Boston, November 15, 1830.

"Having never been on board a steam-boat at the time of a boiler's exploding, nor witnessed the explosion of a steam boiler in any other situation, I am not able to give you much, if any, information in answer to your inquiries as requested in your circular of the 1st of August last, or at least none which can regularly be classed in the list of interrogatories; yet, as my experience in the use of steam in various ways, and for different purposes, has brought to my mind and notice certain facts relating thereto, among them, some which I have never seen noticed in any writings on the subject, I have concluded to communicate them to you, leaving it to your discretion to make such use of them as you may think proper.

"My first experience in steam engines commenced in 1814, in the city of Baltimore, where I was employed by Capt. George Stiles in the manufacturing of the rotary steam engines, which were operated by high steam, of great elasticity, being at times from 150 to 200 lbs. per inch pressure. The boilers, or generators, were of different metals and forms, being of copper, of wrought iron, and of composition metal pipes. During the time I was there, no accident, even of burning or overheating a generator or boiler occurred.

"Since my leaving Baltimore, I have been employed in New York, in North Carolina, and in this city, in the building and operating of engines of both high and low pressure, and have repaired many boilers in steam-boats, which had been overheated, but had not exploded. The steam-boat Eagle, of Boston, owned and commanded by Capt. John Wood, having a low pressure, or condensing, engine, with two cylinder wrought iron boilers, with cast iron heads without flues, two feet six inches in diameter, and twenty-four feet in length each, set in brick work, had her boilers very much injured in the bottoms, or under sides. The injury was attributed to negligence in not keeping them clean, a quantity of sediment having collected in the boilers, and settled at the bottom, and formed an incrustation of from two to three inches in thickness, which was, in some places, so hard as to require a hammer and chisel to disengage it from the bottom of the boilers. The metal, for nearly the length of the boilers, was in consequence so much injured that it became necessary to repair the bottoms with new irons, and to change them; making the parts which were before the under sides, the tops or upper sides, by rolling them in their beds. This damage was sustained in the course of two or three weeks after the boilers were set or put in operation. Whether any explosion would have occurred is uncertain, as the boilers were discovered to leak immediately over the fire in the furnace, and the discharge from those places extinguished the fire.

"A steam-boat with a low pressure engine, called the Massachusetts, of this port, having two cylinder copper boilers, with return flues, was injured by suffering the water to get too low, whereby the flues were uncovered; they were in consequence condemned and taken out. On examination of them, I found the flues, the inner shells, flattened *directly underneath* the safety valve, but in every other part the form was retained. And the query has occurred to me, whether the opening of the safety valve, and shutting it suddenly, may not cause a reaction in the boiler, upon the principle of the hydraulic ram, and thus occasion the explosion. The metal, however, was so much injured by the heat as to become hard, flinty, and brittle, losing all its tenacity and malleability, and was supposed by experienced coppersmiths to be gun metal. I have also observed that wrought iron, in similar cases, undergoes a change, whereby it becomes like cast iron. The boilers being taken out, two others of wrought iron, of a cylinder form, with cylinder flues, were put in, and the boat put in operation. From the incrustation formed between the flues and boiler shells, or outer coats, and by letting the water get low, these boilers were injured and condemned also, although they were used but about three weeks.

"The steam-boat Legislator, (a boat which had a boiler exploded in the harbour of New York, by which several persons were injured,) plying between this port and Bath, in the state of Maine, having a low pressure, or condensing, engine, overheated her boiler in consequence of the forcing pump being out of order, whereby the water was not kept up. The oval or elliptical furnace flue was much flattened on the upper part, but before any explosion took place, the fire was extinguished, and the boiler got cool before water was forced in, or the boiler filled. I was informed by the agent who was on board at the time, that the *upper part* of the shell, or outer coat, of the boiler was afterwards discovered to have been heated to so great a degree as to burn a woollen jacket which was laying on it.

"I am of opinion that had the forcing pump been put in operation prior to cooling the boilers, the liability to an explosion would have been great. I afterwards repaired the boiler, and discovered the iron to be hard and brittle in those parts where it was much exposed to heat.

"As these are the only instances of extraordinary injuries to boilers which have come within my observation, you will perceive my information is very limited as to the subjects of your inquiry. My opinion is, that in every one of these cases, the injury might probably not have occurred, had a proper degree of attention been given by those entrusted with the management of the machinery; at least, the injury did not arise from any defect of the materials.

"Presuming that much of the information which will be derived, as to the cause of explosions of steam boilers, will be matter of opinion, I will take the liberty of stating what has appeared to me as having been the cause of many of the explosions in the boilers on board of steam-boats in the waters of the United States. And first, to want of skill may be fairly attributed many of the accidents which have happened, whether attended with explosions or not. The introduction of steam navigation has been so rapid that men of character, capability, intelligence, skill, and sobriety, were difficult to be procured in sufficient numbers; and such, when employed, demanded liberal compensation for their services. The several owners, competitors in the various lines or routes, governed by a mistaken policy, rather than pay the wages demanded by competent and skilful engineers, have in many cases employed those as engineers whose whole knowledge consisted in understanding how to stop and start an engine; and as firemen, those whose only qualification was, that they could throw wood into the furnace. Hence, when any part of the machinery happened to be disordered, those entrusted with its management, being conscious of their want of science and skill, became incapable of applying the limited knowledge which they possessed, and injury and accident ensued.—Again, engineers and firemen on board of steam-boats have been, not unfrequently in times past, and I believe they are still, in some cases, at present, treated with intoxicating liquors by the passengers, and thereby rendered incompetent to manage the machinery."

(No. XVIII.)

Anonymous communication received from England, through P. Vaughan, Esq. of London.

Sir,—In consequence of a notice in the Mechanics' Magazine, I trouble you with this letter, and beg attention to the accompanying newspaper communication. I am of opinion that a boiler constructed with a safety plate, such as described, would not burst.

A boiler belonging to a colliery engine of mine has had such a plate on for several years, working at high pressure. A few months ago I directed the engine man to fasten down one of the ordinary safety valves, and overload the other, make a large fire under the boiler, and wait the event; he did so, and the result was the tearing asunder of the leaden plate with a loud explosion, without any damage whatever to the boiler or engine. The plate gradually thins and protrudes in the middle, and at last tears across, thus +, leaving four angular pieces standing up like spear heads.

Leaden plugs have been tried, to melt with hot steam, but this plan does not do, because it requires the steam always to be of a certain intensity before the lead can melt; whereas, an old boiler might burst before the steam acquired such intensity. Now my plate need only be a few degrees stronger than working steam, whatever strength it be, and any thing beyond that will tear it and save the boiler.

If you have any wish, I will send the torn lead plate, and any communication will reach me through the hands of Mr. Mort, Newcastle, Staffordshire.

SAXULA.

September 8, 1830.

P. S. The efficacy of this plate is certainly such, that I think it cannot be too soon or too generally tried, previously to any extensive investigation, as I think it almost impossible to ascertain the particular causes of the bursting of many boilers, beyond the over-strength of steam; all moveable valves are liable to "gag," or stick in the sliding parts, from unforeseen, and often unknown causes. A lead plate cannot cease to act, unless a stronger be purposely screwed over it.

To the Editor of the Staffordshire Advertiser.

SIR,

> "Govern these ventages with your finger and thumb."
>
> SHAKSPEARE.

As I trust the time is fast approaching when we shall see carriages propelled by steam traversing our common roads in all directions,—but at what speed I dare not undertake to say: and as there is a very prevalent feeling of dislike to, or fear of their introduction, on account of apprehended dangers from explosion of the boilers, I have no doubt you will feel a pleasure in assisting to disperse as widely as possible, the following most simple and efficacious preventive from any such dreadful catastrophes.

Your readers may suppose the invention to have arisen out of the following familiar occurrence, which forms the strongest illustration that I can give of its principles and efficacy.

A narrow mouthed stone ware jar, filled with fruit, and closed by a bladder, was placed in a kettle of boiling water to stew. The sirop of the fruit soon became as hot as the water, and then steam began to form, which having no vent, at last burst the bladder and escaped. Now, had the bladder been as strong as the jar, the steam would have been confined until its strength became sufficient to burst the jar, and discharge at once its whole contents, the consequences of which may easily be imagined.

On the top of my boiler, in addition to the usual safety valves, I place a pipe of dimensions sufficient to discharge the steam gradually. The orifice of this pipe I cover with a plate of thin sheet lead, strong enough to hold steam of proper working strength. Now, should any cause obstruct or overload the safety valves, as soon as the steam becomes too strong, the sheet lead tears asunder and discharges it. It is impossible to burst the boiler. This, I believe, wants no science to make it plain, any one may understand it;—a report will be heard, and the journey will be delayed, but no damage can ensue.

Even the "great steam chamber (A,) alias safety chamber, alias danger chamber," about which there was so much bickering a few months ago in the Mechanics' Magazine and the Register of Arts, will become with this appendage, quite harmless.

Such is the safety of this simple contrivance, that I think it would not be unworthy the notice of parliament, making it penal for a boiler to be found without it, at the same time regulating the size of the orifice, and thickness of the lead.

This security is attached to the boiler of my little steam carriage, the "Triumph," heretofore noticed in your columns; the pipe is one inch diameter, and the lead about the thickness of brown paper.

* * * * *

Yours,

May 5, 1830. SAXULA.

(No. XIX.)

To the members of the Franklin Institute.

Since the frequent disasters occurring on board of steam-boats by the explosion of boilers, public attention has been aroused, and the executive of the nation called upon by the voice of the representatives of the people for information, and also your body have called upon engineers generally for information, as to the adoption of suitable means for the prevention of those accidents which have hurried into eternity hundreds of our most valuable and highly respected fellow citizens. It therefore behooves every engineer, however humble, and however unknown to the public, after being called upon by you, to give his views, that from the united opinions of engineers on this subject, something may be gleaned which may lessen those disasters, or entirely prevent their recurrence.

The undersigned, an humble individual of the profession, not known, or wishing to be, by writing on this subject, would respectfully lay his opinion before your more enlightened judgment.

In the first place I assert, without fear of contradiction, that two-thirds of the accidents, are to be attributed to nothing but ignorance; and from this cause, that men who are perfectly acquainted with their business cannot be had except at high wages; and through a mistaken notion of economy, a fireman is taken, who has gained the experience of stopping and starting an engine, but who is entirely ignorant of its principle; aye, some who could not tell you whether the engine they were attending was high or low pressure! And thus the grandest machine ever invented, and the lives of thousands, are placed in the hands of ignorance. No wonder that explosions occur!

Secondly. It is a general rule with engineers, on both land and water, with both high and low pressure engines, that the moment they are stopped, the safety valve is raised, and the steam let off, which I think is entirely wrong, (although it is an old practice,) for these reasons, which I submit to your better judgment. It is a rule with engine builders, to make their boilers capable of resisting twice, thrice, or four times the pressure calculated to be borne upon them; and very often when a steam engine is in operation, we see the steam blowing off. And why, I would ask, is not a boiler as safe when the engine is not in operation? The disadvantage in blowing off steam, I conceive to be this, that the water in the boiler is lowering and passing away in steam; whereas, should the safety valve be left down, the steam by degrees would condense in the boiler, and very little water be lost in evaporation.

Thirdly. There should be some means adopted whereby the pressure carried on safety valves should be regulated, and not leave it to ignorance to place a greater weight thereon, perhaps for the purpose of outrunning an opposition boat, or under the influence of spirituous liquor.

Fourthly. Great care should be taken at all times to have a sufficient quantity of water in the boiler, for it is a well known fact, that if the water descends below the flues of the boiler, the fire immediately acts upon the iron or copper, and it is burned through before it is possible to supply it with water.

I would now take the liberty, after the foregoing remarks on this important subject, to recommend a remedy which I think, if adopted, would lessen, or, as I have said before, prevent the recurrence of steam-boat accidents, viz. that three engineers, theoretically and practically acquainted with the business, should be appointed in different central places on all our rivers, or where steam-boat navigation extends, whose duty it should be to examine the engineers employed on board of steam-boats, as to their practical and theoretical knowledge of engineering, and after such examination a diploma or certificate should be granted them if found proficient, and that there should be a penalty imposed upon the owners of any boat who should employ an engineer on board of their boat who had not a diploma signed by the examining engineers. And also that it should be the duty of said examining engineers, to examine every boiler and prove the same, either by steam or water, as may seem to them best, and condemn every boiler which should not bear four times as much pressure as is necessary on the safety valve when the engine is in operation, and this examination to be gone through once a year. Also to regulate the pressure to be carried on every boiler, and after such regulation a penalty should be incurred by the engineer should he, from any cause whatever, place more weight on the safety valve than the examining engineers had determined should be carried thereon.

A PRACTICAL ENGINEER.

Philadelphia, November 2, 1830.

(No. XX.)

December 1, 1830.

Sir,—I take the liberty of communicating to you my views of the causes of the explosions that so often take place in steam boilers, agreeably to the solicitations in the circular addressed to the public by your committee of the Franklin Institute appointed for that investigation. I do not pretend that my ideas are all new, but the treatises I have seen on steam, have given less attention to some of them, than I conceive due to a full understanding of the matter.

The explosions of steam boilers, it is believed, have been much more frequent on the waters of the Mississippi river than elsewhere, and even in greater proportion to the number of engines in use. The accounts given of these disasters, report them to have occurred at landing places, or at the first working of the engine after delays, as at wood yards or towns on the river. During these delays it is to be observed that the engine is stopped from working, and the water in the boilers is diminishing by evaporation, so that a considerable portion of them above the level of the water, is left to be heated to a temperature that will rapidly produce steam when the water may be disturbed and thrown in contact with it, and afford one material cause of the explosions which take place. And although the fires are not kept up during these delays, yet there is heat enough in the furnace to keep up a high temperature, and together with the firing up before starting, is sufficient to charge the fluids within the boilers to their highest capacity while in their quiescent state with caloric. Under these circumstances, the engine is to be put in motion; when the first evacuation of steam will necessarily give rise to an ebullition of the water in the boiler, and excite to activity the super charge of caloric in the water and steam within, which together with the cause above shown will give an explosive power that no steam boilers can resist: or, in other instances, the motion of the boat may aid or entirely produce the same effect on starting from a state of rest.

Such I conceive to be the cause of the greater part of the accidents that occur on the western waters. To remedy which, I would suggest that at all delays of more than ten or fifteen minutes, the engine should be thrown out of gear with the wheels, and kept in operation till cool; or in case of firing up again, the engine be worked till the boat should be ready to start. By these cautions the danger incident to the stopping of the engine will be obviated, the boilers will have their full supply of water, and the working of the engine will prevent the accumulation of caloric in a latent or inactive state in the water and steam they contain. That heated water will yield more steam when agitated than when at rest is certain, the increased evaporation caused by agitation at all temperature is well known; from which it appears, that caloric may pass into water in a latent form, and be made active again by mechanical means, and no doubt aids much to produce the effects here assigned to it.

There is another kind of explosion more violent and destructive than the above. These occur when the boilers are not supplied with water, either from the failure of the pumps, or neglect of the engineer. In such cases, the first indication of the mischief is the failure of the engine to perform its work. As the water gets exhausted, the parts of the boiler above its level become heated, beyond what the steam can counteract, and soon will acquire a degree of heat to decompose steam. Here then are two causes counteracting each other: the water converting into steam in a decreasing ratio, and the heated boiler destroying it in an increasing one; from which it is evident there will be a time when the force of the engine will cease, and the water in the boiler no longer held under a pressure from the steam, will rise into foam, so as to come in contact with the whole interior surface of the heated boiler; which, from this contact, will change its temperature from decomposing the water, into that suitable to convert it into the most powerful steam. This change, it will be observed, is not instantaneous, to produce the most violent shock at first; the boiler will require some moments of time to pass through the change, and hence produce the most violent effect even after the breach may be made. This accounts, to my satisfaction at present, for the perplexing things observed in these strange accidents: such as the loss of steam, the breach, and the violent explosions that follow.

The evil to be corrected, on the above suggestions, is no longer to be sought for in the construction of the machines. The danger lies in the combined elements of fire and water, which in some intricate stages will not suffer our control. I have no doubt but the engines in general are, in every respect, suited to their purpose; and if managed with proper care and skill, may be used with the utmost safety; but without these the strongest made engine is as dangerous as the poorer ones. It is to the ignorance and carelessness of those who have charge of engines, that so many melancholy accidents from steam boilers are to be assigned. The greater part of the engineers and officers on board of steam-boats whom I have met with, I have found quite ignorant of the nature of the power they are using. The former generally acquire their responsible profession at the engine factories, or in the duties of firemen. It is not supposed, therefore, that they should be acquainted with the *science* of steam. I have even known those of the highest standing to be entirely ignorant of the principles of the common pump, and unable to correct the bad working of the machine but by repeated trials, during which the greatest mischief may arise. The officers of the boats are but too generally no better informed in the principles of mechanical forces, as well as of fluids, liquid and aeriform, by which all their operations are carried on.

The remedy to the foregoing evils will now suggest itself. The subject of steam and steam engines must be fully explained, and regularly taught, in our institutions and schools of science; and made the subject of lectures and instruction for the benefit of those engaged in it, particularly of those who are to have charge of and to work the engine. And, in fine, a state of things should be brought about, by which those who would wish to follow this profession, should be known by their testimonials to be men of steady habits, and possessing that kind of knowledge which fits them for the trust.

The cause of humanity requires of us to do away with the dangers so unnecessarily put upon our fellow beings, and while our scientific institutions are devoted to the advancement of the most useful instruction, let them all unite and diffuse, generally, that knowledge which is of the utmost importance for the safe and prosperous application of the greatest invention that has ever been made. Let steam be a subject of study and instruction in proportion to its value, and when once a thorough knowledge of it is circulated, we shall find that safety in it which is so much to be desired.

These ideas, if of any value, are humbly inscribed to the Franklin Institute, by G. W. L.

(No. XXI.)

Reply to a circular letter of the committee appointed at a meeting of the Board of Managers of the Franklin Institute, to inquire into the causes of the explosion of the boilers of steam engines.

Louisville, August 8, 1831.

Gentlemen,—Since I became a subscriber to the Journal, I have perused your circular letter inquiring into the causes of the explosions of the boilers of steam engines, and it afforded me much pleasure to see the interest which you have manifested in ascertaining the causes of these melancholy accidents, and devising some plan by which they may be avoided. The numerous explosions which have taken place within the last two years, are alarming, and are almost sufficient to deter a person from travelling in a steam-boat. I am induced to believe, from observation and experience, with yourselves, "that those explosions were produced rather by imperfection in the construction, arrangement, and management of the machinery, than by any inherent and irremediable source of danger in the invention itself." There are now many men engaged and engaging in the engineering business, through the influence of their friends and relatives, who are interested in boats, who are not mechanics of any description; they learn, in a short time, how to start and stop an engine, but know nothing about the first or constituent principles of the machinery, or the construction of it; they know but little about the dangerous properties of steam under some circumstances; they are unable to understand the different effects which occur about an engine; they are ignorant of the pressure which boilers of different sizes and thicknesses are able to sustain; consequently the safety valve is frequently overloaded at the risk of the lives of three or four hundred passengers. It is unquestionably evident, beyond the possibility of doubt, that no man can be capable of doing justice as an engineer who is entirely ignorant, both of the theory and practice of mechanics; (as well might a man attempt the practice of medicine without a knowledge of anatomy;) and so long as men of this kind are employed in boats, so long will accidents occur, in which many valuable individuals will be blown to eternity, leaving in many cases destitute wives and children to lament their untimely death. Humanity calls aloud for some measure to be taken, to prevent, if possible, these explosions, particularly when we reflect that within the last two years, upwards of one hundred persons, on the Ohio and Mississippi rivers, have fallen victims to the mismanagement of that powerful agent, steam. The subject of explosions is one that has engaged my attention for some time, and I have been collecting all the information I could from some of these accidents, of which I shall proceed to give you an account, agreeably to your request. I have endeavoured to collect the facts as correctly as possible, though in some instances it was difficult to arrive at the truth; for some engineers who were on board at the time of these accidents, and who escaped unhurt, are unwilling to acknowledge that any thing was going wrong at the time of an explosion; so, in some instances, I have relied more upon the information I obtained from passengers. In giving a description of these explosions, I will add my opinion of the causes, according to Mr. Perkins's theory, which I believe to be very applicable.

The boiler of the steam-boat Atlas, which was built for towing vessels, burst on the 1st day of April 1828, at the mouth of the Mississippi. She came to alongside of a vessel to tow it up to New Orleans, and as soon as they had made fast, they rang the bell to go ahead. The first engineer started her, and after she had made two or three revolutions, one of the boiler heads blew out at the after end; the second engineer was the only person killed. The steam may have been higher than the engineer was aware of, but it seems that the principal cause of this accident was that the boiler head was not sound; it was of cast iron, and upon examination they found many small holes in the internal part of the head; and in addition to this, the head was only about one inch thick, which was much too thin.

The Car of Commerce was the next boat the boiler of which burst. On the 15th of May, 1828, as she was on her way from New Orleans to Louisville, and had got up the Mississippi as far as the Canadian reach, her force pump became heated, and refused to supply the boilers. The engineer stopped her a few minutes to cool down the force pump, and then started her again; but still the pump refused to supply the boilers; they then stopped a second time to examine the pumps, and after a few minutes delay, they started her again, but the engine had not made more than two or three revolutions before the after head of one of her boilers blew out, and killed twenty-six persons, including three engineers. When the head blew out, the reaction of the atmosphere was so great that her boilers, four in number, jumped forward and fell upon the deck. Unfortunately it seems that this boiler head had been cast from the same pattern which had been used for the Atlas. The engineers were apprized of its being cracked previous to the explosion; but, independently of this, there can be no doubt that the water was low in the boilers, as the force pump had failed, and the engineer perhaps neglected to have the fires sufficiently damped, which I know to be frequently the case when an engine is stopped, while under way, to repair something which it is supposed will occasion but a few minutes delay. In the case of the Car of Commerce, it is generally believed that the water had sunk below the top of the flues in the boilers, which became then exposed to the action of the fire. The steam exposed to the influence of those flues which were most probably red hot, became intensely heated, though of little elastic force; the throttle valve was opened at this time; a discharge of steam followed; the water which before was quiet, being suddenly relieved from the pressure upon its surface, rising up in contact with the heated flues and steam, was instantly converted into vapour, whose elastic force was so great as to produce an explosion.

The boiler of the tow-boat Grampus exploded on the 11th of August, 1828, about eight miles below New Orleans. She was bound up, with two or three vessels in tow at the time when this occurred, which was in the night. The second engineer, who had been placed on watch, had gone to sleep; when he awoke, he found that the water had sunk below the lower gauge cocks, and it is thought that he immediately let on a full supply from the force pump. One person on board noticed his being alarmed when the gauge cocks indicated no sign of water, and shortly afterwards the explosion took place. She had eight double flue boilers, which were all blown overboard, except two pieces of boiler, one about six feet square, and the other about four; besides there were three or four flues remaining on deck, some of which were partly collapsed. Nine persons were killed, including the second engineer; and the damage of the boat was estimated at eight thousand dollars. In this case, the boilers must have been nearly dry, and the flues red hot; and in this situation the engineer it seems let on as much water as the force pump could throw. According to Mr. Perkins's theory, the water, in entering the boiler, was instantaneously flashed into steam of great elasticity, and as the strength of the boilers was much diminished in consequence of their being heated to a very high temperature, it did not require much elastic force to tear them asunder.

A flue of the steam-boat Patriot collapsed in the spring of 1828, near the mouth of the Ohio, on her way from Louisville to New Orleans. The second engineer was on watch, and neglected his business so far as to let the water sink below the flues. In this situation he kept the engine going without having the fires damped, until a flue collapsed and killed two persons. This accident was entirely owing to the sinking of the water below the top of the flue, which was exposed to the fire on the inside, and which, being unprotected by water on the outside, soon became red hot; consequently, its strength was so far diminished that the pressure of the steam, within the boiler, forced its sides together.

One of the boilers of the *Kenhawa Packet* burst on the 27th of June, 1829, at Guyandot, on the Ohio river. In giving a description of this accident, I have relied on the information I obtained from an engineer who was a passenger on board the boat. They landed to put out some passengers, and expected to start again in a few minutes, but were detained above half an hour. The engineer probably thought that the water was flush enough in the boilers, as he did not run the engine out of gear, which is always done immediately after upon making a landing, in order to keep a supply of water in the boilers. When they shoved out from shore, the engineer found the water had sunk below the gauge cocks, and he appeared to be a little alarmed, as the steam was very high. After they had shoved out from shore, and before they could start, a passenger had to be sent ashore in the yawl, which occasioned further delay, and just as the engineer was going to start the engine, one of her boilers burst and killed eight persons, including the two engineers. I examined this boiler myself; both heads were blown out; they were of cast iron; the flue was separated about the middle, and the forward end of it was thrown overboard; the boiler was torn in a spiral form about half its length, and spread out nearly to a plane surface. This I think was a case similar to that of the Car of Commerce, and especially produced by the opening of the safety valve, which occasioned the water to rise in contact with the heated flues and steam. I know it to be a fact, from experience, that water will rise up in a boiler when the safety valve is opened, for not long since, as I was running an engine, finding that the force pump refused to supply the boilers, I immediately stopped and damped the fire, and upon examination I found that the water had sunk below the lower gauge cocks, which are generally situated about two inches above the flues, in the end of the boiler. By hoisting the safety valve for a few seconds, I found that the water rose up flush with the gauge cocks, and by closing the valve the water again sunk.

A flue of the steam-boat Huntress collapsed on the 11th of April, 1830, near Golconda, on the Ohio river; four persons were killed, including the first engineer, who was on watch at the time. The boat was stopped to send the yawl ashore with a passenger, during which time the engineer blew off steam occasionally, and when the yawl returned, he started the engine, though it did not make more than two or three revolutions before one of the flues collapsed. It was the general opinion on board that the water was low in the boilers; so this accident may be accounted for upon the same principles as that of the Patriot. This accident, and many others of the same kind, might have been prevented if they had stopped in time, and damped the fires; but it is a melancholy fact, that many engineers are ignorant of the rapid evaporation which is going on in boilers when an engine is stopped and the fires burning lively; they are not sensible of the liability to danger under these circumstances.

A boiler of the *steam-boat Caledonia* blew up a few days after that of the Huntress, and killed between twenty and thirty persons. She was on her way from New Orleans to Louisville, and had ascended the Mississippi up to New Madrid. This explosion took place while the boat was under way, and it was immediately reported that every thing was in order at the time, that the water was flush in the boilers, and the steam not very high; but I have conversed with several passengers who were on board, two in particular, who told me they were willing to make oath that they saw the first engineer, who was on watch, try the gauge cocks, and that there was not a particle of water to be seen, and that the steam was very high; that the engineer appeared to be alarmed, and that they anticipated danger themselves, and left the engine room, but had scarcely got on the upper deck when the boiler burst. It appears that a good deal of mud had collected in her boilers, as the engineers had some trouble for a day or two previous in keeping up a supply of water. The mud from the Mississippi water collects in boilers very fast, and sometimes stops up the connexions between some of the boilers, so that water may be seen flush in some of them, when it is below the gauge cocks in others. I examined the Caledonia's boiler after she was towed up to Cincinnati; it burst near the bottom, close to the forward end, though neither of her heads was blown out. The boiler was torn open about half way around, in the direction of the rivets in some places, and across the sheets in others. This boiler had been repaired a few months before in the very place that gave way, and copper rivets were used instead of iron; this was one of the principal causes of the explosion, for copper will sustain but little more than half the pressure that wrought iron will.

At the place that gave way in this boiler, the iron was burned until it was but little more than an eighth of an inch thick, which was not much more than half its original thickness. When boilers are suffered to get very muddy, the sediment collects in the bottom, until a crust or scale of the carbonate of lime is formed, which soon becomes so hard as to be impenetrable to water; consequently, the boiler will be burned when it is not directly protected by water on the inside. It has frequently happened that holes were burned in boilers by the fireman's accidentally leaving a piece of apron or broom inside when they were cleaning them out; and I have known boilers to be burned until they were scarcely a sixteenth of an inch thick at the bottom, while they retained a thickness of a quarter of an inch at the top; though I do not think this would ever occur with proper attention.

A boiler of the *Helen M'Gregor* burst on the 24th of February, 1830, at Memphis, on the Mississippi, as she was bound up the river. The boat had landed to put out some freight, and just as they had shoved out to go ahead again, one of her boilers burst before the engineer had started her. It is not known how many persons were killed, but somewhere between thirty and forty. It was the after head of one of her boilers that blew out; it was of cast iron, and had been cracked two or three years, and it jumped out of its place from the others about one hundred yards into the river. The principal cause of this accident I suppose was that the boiler head was cracked, a circumstance of which the engineers were apprized, and they ought not to have trusted it; in addition to this, the steam was very high at the time the explosion took place.

A boiler of the *steam-boat Tri-Colour* burst last April at Wheeling, on the Ohio river, and killed thirteen persons, including the captain and second engineer. The first engineer, who escaped unhurt, has given me, I believe, a correct account of this explosion. He states that he was on watch when the boat landed, and that he ran up the water flush in the boiler, and had the fires damped down before he stopped the engine, as they were going to lie there long enough to make some repairs to the boat. He went into the hold to give a smith directions about making some bolts, and then came out and went to his breakfast, but before he had quite finished, the captain came to the door and observed that the steam was up, and he wished to start. The engineer immediately rose from the table, went out, and found that the steam was very high, and the fires burning lively, and before the bell rung to go ahead, the boiler burst. The captain had ordered the fireman to kindle up the fires, without ever giving the engineer any warning, so that this accident was owing principally to the imprudent conduct of the captain; and it is too often the case that captains interfere when they should not, and affect to know more about the engine, than those who have the management of its mighty power.

This was a low pressure boat, and all the others which I have spoken of were high pressure. The engineer told me he had been blowing off steam just before the boiler burst, and he thinks probably from the length of time which the fires had been burning without his knowledge, that the water had sunk below the flues. There was but one boiler in this boat; it was made after the old plan, with the furnace inside, and the place that gave way was inside of the furnace, directly over the fire grates. This boiler had been in use about ten years, and if many other boilers now in use, nearly of the same age, on the western rivers, could be subjected to the proof which the law requires at present in France, they would be condemned before they occasioned the loss of many lives; and I anticipate with pleasure the arrival of that time, which I hope is not far distant, when Congress will take up this subject again, and pay that attention to it which humanity calls for.

Four accidents have occurred within the last month, where flues were collapsed, and twelve or thirteen persons killed; and they were entirely owing to negligence or ignorance on the part of the engineer. I could enumerate more of these melancholy accidents, but as I have already transcended the limits of a letter, and probably imposed on your patience, I will desist.

It has been urged by some persons here, who are not acquainted with this subject, that some of these explosions could not have been prevented, because there was an old experienced engineer on board; but it requires no argument to prove that it is not length of time that makes a man more capable; for nature has not endowed every man with the same mechanical ingenuity and intellectual capacity. Many persons are engaged during their lifetime, at some mechanical business and never attain to mediocrity; I know some men who have been engaged for eight or ten years at the engineering business, and who do not know near as much about steam and working machinery as some who have not been at it more than three or four years. You have enquired first "What are the probable causes of the explosion of boilers on board of steam-boats?" I have endeavoured to answer this inquiry in giving a description of some of these explosions. You have inquired in the second place, "What are the best means to obviate the recurrence of these evils, or to diminish the extent of their injurious influence, if they cannot be wholly guarded against?" In answer to this inquiry I would say, in order to prevent these evils, adopt such a plan as the royal ordinance of France prescribes in relation to boilers. Further, cast-iron boiler heads should certainly be prohibited from use, as experience has proved them to be dangerous; and then the most essential thing, is to have a good engineer, for there can be no security in the use of even the strongest and best constructed boiler, if it be left to the management of a man who is ignorant of his duty, or of the strength of the engine. In the third place, you inquire, "By what means can these remedies be applied and enforced?" I shall answer this inquiry by saying, that I believe Congress have it in their power to enforce the means. You have asked for information relative to the boiler, safety valve, supply of water, and so forth. I am not able to give the exact dimensions of the boilers that burst, though I may give them approximatively.

Boilers here are of wrought iron, (none of copper,) made from thirty-two to forty-two inches in diameter, and from three-sixteenths of an inch to one-quarter of an inch thick, some of foreign, and some of American iron; and the difference in the strength of the two is but trifling when they are both well manufactured. The safety valves are from three to five inches in diameter, situated on top of the boilers, loaded with from eighty to one hundred and twenty-five pounds to the square inch; and sometimes considerably more no doubt, as there is scarcely one engineer in twenty that can make a calculation of a safety valve. The generality of boats have but one safety valve, some have two; the Caledonia had four. A safety valve has no more tendency to prevent an explosion under some circumstances, particularly when the water gets low in the boilers, and steam high, than the touch hole of a gun has to prevent the barrel from bursting. When steam gets extremely high, and water low, the safety valve should not be opened, as is so frequently done, instead of damping down the fires. The mode of supplying the boilers with water is with one, and sometimes two, force pumps, which with proper attention I believe to be a good arrangement.

In concluding this letter, permit me to acknowledge my inability to do justice to the subject, and if any thing that I have said should merit your attention, I shall think it an ample recompense for my trouble.

THOS. J. HALDERMAN.

[TO BE CONTINUED.]

Continuation of the Report of the Committee of the Franklin Institute of Pennsylvania, appointed May, 1829, *to ascertain, by experiment, the value of Water as a Moving Power.*

(Continued from p. 373, vol. viii.)

TABLE N.—PART I.

CHUTE No. 6.—*Elbow buckets. Close breast. Bottom of gate* 3.66 *feet above bottom of wheel.*

No. of Exper't.	Head of Water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	W't of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of Bkt.	Btm. of Bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	16.59	17.65	18.25	1.00	566	48.95	614.95	41.5	32	12.20	4500	20.75	933750	255204	.273			
2					669	50.58	719.58		37	10.56	5050		1047875	298624	.283			
3					772	52.21	824.21		39	10.02	5775		1198312	342046	.285	.285	10.02	
4					875	53.84	928.84		45	8.71	6700		1390250	385468	.275			
5	16.59	17.65	18.25	1.25	566	48.95	614.95	41.5	26	15.04	4900	20.75	1016750	255204	.250			
6					669	50.58	719.58		28	13.96	5300		1099750	298624	.271			
7					772	52.21	824.21		32	12.20	5750		1193125	342046	.286			
8					875	53.84	928.84		34	11.50	6325		1312437	385468	.293	.293	11.50	
9					978	55.47	1033.47		37	10.56	7025		1457687	428889	.293		10.56	
10					1081	57.10	1138.10		45	8.71	8475		1758562	472310	.267			
11	13.59	14.65	15.25	0.75	416	46.59	462.59	41.5	37	10.56	3730	17.75	662075	191974	.289			
12					463	47.32	510.32		41	9.54	4050		718875	211782	.294	.294	9.54	
13					519	48.21	567.21		47	8.32	4525		803175	235392	.293			
14	13.59	14.65	15.25	1.00	566	48.95	614.95	41.5	34	11.50	4825	17.75	856437	255204	.298			
15					669	50.58	719.58		39	10.02	5425		962937	298624	.300	.300	10.02	
16					772	52.21	824.21		45	8.71	6450		1144875	342046	.298			
17	13.59	14.65	15.25	1.25	669	50.58	719.58	41.5	30	13.02	5675	17.75	1007312	298624	.296			
18					772	52.21	824.21		34	11.50	6200		1100500	342046	.310			
19					875	53.84	928.84		38	10.28	6950		1233625	385468	.312	.312	10.28	
20					978	55.47	1033.47		42	9.31	8350		1482125	428889	.289			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE N.—PART II.

CHUTE NO. 6.—*Elbow buckets. Close breast. Bottom of gate* 3.66 *feet above bottom of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	'Pds.	Feet.						
21	10.59	11.65	12.25	0.75	360	45.69	405.69	41.5	38	10.28	3725	14.75	549437	168361	.306			
22					416	46.59	462.59		41	9.54	4040		595900	191974	.332	.332	9.54	
23					463	47.32	510.32		46	8.50	4500		663750	211782	.303			
24	10.59	11.65	12.25	1.00	463	47.32	510.32	41.5	34	11.50	4740	14.75	699150	211782	.302			
25					566	48.95	614.95		39	10.02	5280		778800	255204	.328	.328	10.02	
26					669	50.58	719.58		46	8.50	6200		914500	298624	.326			
27	10.59	11.65	12.25	1.25	566	48.95	614.95	41.5	32	12.20	5625	14.75	829687	255204	.307			
28					669	50.58	719.58		37	10.56	6150		907125	298624	.329	.329	10.56	
29					772	52.21	824.21		39	10.02	7050		1039875	342046	.328			
30					875	53.84	928.84		45	8.71	8035		1185262	385468	.325			
31	7.84	8.90	9.50	1.00	463	47.32	510.32	41.5	38	10.28	5175	12.00	621000	211782	.340			
32					566	48.95	614.95		44	8.88	5925		711000	255204	.357	.357	8.88	
33					669	50.58	709.58		56	6.98	7225		867000	298624	.344			Head sunk four inches
34	7.84	8.90	9.50	1.25	463	47.32	510.32	41.5	34	11.50	5625	12.00	675000	211782	.313			
35					566	48.95	614.95		38	10.28	6150		738000	255204	.345	.345	10.28	
36					875	53.84	928.84		57	6.86	9325		1119000	385468	.344			
37					978	55.47	1033.47		65	6.00	10800		1296000	428889	.330			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE N.—PART III.

CHUTE No. 6.—*Elbow buckets. Close breast. Bottom of gate* 3.66 *feet above bottom of wheel.*

No. of Exper't.	Head of water above. Btm. of gate.	Head of water above. Top of bkt.	Head of water above. Btm. of bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
38	4.34	5.40	6.00	1.50	566	48.95	614.95	41.5	44	8.88	7625	8.00	610000	255204	.418			
39					669	50.58	719.58		50	7.82	8750		700000	298624	.426	.426	7.82	
40					772	52.21	824.21		58	6.73	10100		808000	342046	.419			
41	4.34	5.40	6.00	1.75	566	48.95	614.95	41.5	40	9.77	7425	8.00	594000	255204	.429			
42					669	50.58	719.58		45	8.71	8290		663200	298624	.450	.450	8.71	
43					725	51.45	776.45		49	7.98	8975		718000	322226	.448			
44					772	52.21	824.21		52	7.52	9525		762000	342046	.448			
45					828	53.02	881.02		55	7.10	10325		826000	365623	.442			
46	1.00	2.06	2.66	1.50	360	46.61	406.61	41.5	63	6.20	6760	4.66	315692	168743	.531			
47					416	47.62	463.62		75	4.30	7500		350250	192402	.548	.548	4.30	
48					463	48.48	511.48		79	4.95	8370		390879	212264	.541			
49	1.00	2.06	2.66	1.75	360	46.61	406.61	41.5	61	6.40	6750	4.66	315225	168743	.531			
50					463	48.48	511.48		73	5.35	8160		381072	212264	.555	.555	5.35	
51					519	49.31	568.31		81	4.83	9100		424970	235847	.553			
52					566	50.35	616.35		89	4.40	9925		463497	255785	.554			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE O.—PART I.

CHUTE No. 6.—*Centre buckets. Close breast. Bottom of gate 3.66 feet above bottom of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of ate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pds.	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	19.34	20.40	20.40	1.00	463	47.32	510.32	41.5	33	11.84	3930	23.00	903900	211782	.233			
2					566	48.95	614.95		36	10.86	4450		1023500	255204	.249			
3					669	50.58	719.58		40	9.77	5150		1184500	298624	.252	.252	9.97	
4	19.34	20.40	20.40	1.25	463	47.32	510.32	41.5	25	15.64	4425	23.00	1017750	211782	.207			
5					566	48.95	614.95		27	14.48	4700		1081000	255204	.236			
6					669	50.58	719.58		30	13.00	5250		1207500	298624	.247			
7					772	52.21	824.21		34	11.50	5850		1345500	342046	.254	.254	11.50	
8					875	53.84	928.84		42	9.31	7000		1610000	385468	.239			
9	16.59	17.65	17.65	0.75	360	45.69	405.69	41.5	37	10.56	3225	20.75	669187	168361	.251			
10					463	47.32	510.32		49	7.98	3950		819625	211782	.254			
11					566	48.95	614.95		60	6.50	5250		931875	255204	.273	.273	6.50	
12	16.59	17.65	17.65	1.00	360	45.69	405.69	41.5	25	15.64	3675	20.75	762562	168361	.223			
13					463	47.32	510.32		29	13.48	4050		840375	211782	.252			
14					566	48.95	614.95		33	11.84	4550		944125	255204	.270			
15					669	50.58	719.58		37	10.56	5175		1073812	298624	.278	.278	10.56	
16					772	52.21	824.21		43	9.09	6050		1255375	342046	.272			
17					875	53.84	928.84		54	7.24	7625		1582187	385468	.243			
18	16.59	17.65	17.65	1.25	772	52.21	824.21	41.5	32	12.20	6050	20.75	1255375	342046	.272			
19					875	53.84	928.84		36	10.86	6750		1400625	385468	.275	.275	10.86	
20					978	55.47	1033.47		42	9.31	7950		1649625	428889	.259			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE O.—PART II.

CHUTE No. 6.—*Centre buckets. Close breast. Bottom of gate 3.66 feet above bottom of wheel.*

No. of Exper't.	Head of water above. Btm. of gate.	Top of bkt.	Btm. of bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pds.	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
21	13.59	14.65	14.65	0.75	257	44.06	301.06	41.5	30	13.00	2900	17.75	514750	124940	.242			
22					360	45.69	405.69		36	10.86	3430		608825	168361	.276			
23					463	47.32	510.32		43	9.09	4130		733075	211782	.288	.288	9.09	
24					566	48.95	614.95		55	7.10	5175		918562	255204	.277			
25	13.59	14.65	14.65	1.00	463	47.32	510.32	41.5	30	13.00	4410	17.75	782775	211782	.270			
26					566	48.95	614.95		33	11.84	4900		869750	255204	.293			
27					669	50.58	719.58		38	10.28	5525		980687	298624	.304	.304	10.28	
28					772	52.21	824.21		44	8.88	6450		1144875	342046	.298			
29	10.59	11.65	11.65	1.00	360	45.69	405.69	41.5	30	13.00	4150	14.75	612175	168361	.275			
30					463	47.32	510.32		34	11.50	4780		705050	211782	.300			
31					566	48.95	614.95		37	10.56	5325		785437	255204	.325			
32					669	50.58	719.58		43	9.09	6175		910812	298624	.327	.327	9.09	
33					772	52.21	824.21		56	6.98	8100		1194750	342046	.287			
34	10.59	11.65	11.65	1.25	669	50.58	719.58	41.5	34	11.50	6650	14.75	980875	298624	.304			
35					772	52.21	824.21		40	9.77	7325		1080437	342046	.316	.316	9.77	
36					875	53.84	928.84		45	8.70	8675		1279562	385468	.301			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE O.—PART III.

CHUTE NO. 6.—*Centre buckets. Close breast. Bottom of gate 3.66 feet above bottom of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
37	8.34	9.40	9.40	1.00	360	45.69	405.69	41.5	35	11.16	4575	12.00	549000	168361	.306			
38					463	47.32	510.32		39	10.02	5170		620400	211782	.341			
39					566	48.95	614.95		45	8.70	6090		730800	255204	.349	.349	8.70	
40	8.34	9.40	9.40	1.25	463	47.32	510.32	41.5	33	11.84	5875	12.00	705000	211782	.300			
41					566	48.95	614.95		37	10.56	6450		774000	255204	.329			
42					669	50.58	719.58		41	9.54	7300		876000	298624	.340	.340	9.54	
43					772	52.21	824.21		50	7.82	9330		1119600	342046	.305			
44	8.34	9.40	9.40	1.50	669	50.58	719.58	41.5	37	10.56	7790	12.00	934800	298624	.319			
45					772	52.21	824.21		41	9.54	8800		1056000	342046	.323	.323	9.54	
46					875	53.84	928.84		47	8.32	10000		1200000	385468	.321			
47					978	55.47	1033.47		58	6.74	13200		1584000	428889	.270			
48	4.34	5.40	5.40	1.50	463	47.32	510.32	41.5	41	9.54	7070	8.00	565600	211782	.375			
49					566	48.95	614.95		47	8.32	8075		646000	255204	.394			
50					669	50.58	719.58		54	7.24	9370		749600	298624	.398	.398	7.24	
51					772	52.21	824.21		72	5.43	11575		926000	342046	.383			
52	4.34	5.40	5.40	1.75	566	48.95	614.95	41.5	42	9.31	7775	8.00	622000	255204	.410			
53					669	50.58	719.58		48	8.14	8990		719200	298624	.414	.414	8.14	
54					772	52.21	824.21		60	6.50	10825		866000	342046	.399			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE O.—PART IV.

CHUTE No. 6.—*Centre buckets. Close breast. Bottom of gate 3.66 feet above bottom of wheel.*

No. of Exper't.	Head of water above. Btm. of gate.	Head of water above. Top of bkt.	Head of water above. Btm. of bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	W't of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
55	4.34	5.40	5.40	2.00	566	48.95	614.95	41.5	41	9.53	7710	8.00	616800	255204	.413			
56					669	50.58	719.58		46	8.50	8800		704000	298624	.424	.424	8.50	
57					772	52.21	824.21		58	6.74	10750		860000	342046	.397			
58	1.00	2.06	2.06	1.50	257	44.74	301.74	41.5	60	6.50	5850	4.66	273195	125222	.458			
59					360	46.61	406.61		72	5.43	7225		337407	168743	.500			
60					463	48.48	511.48		90	4.35	8800		410960	212264	.521	.521	4.35	
61					566	50.35	616.35		108	3.62	10925		510197	255785	.501			
62	1.00	2.06	2.06	1.75	463	48.48	511.48	41.5	81	4.83	8625	4·66	402787	212264	.526			
63					566	50.35	616.32		96	4.07	10325		482177	255785	.530	.530	4.07	
64					669	52.22	721.22		123	3.18	12675		591922	299306	.505			
65	1.00	2.06	2.06	2.00	360	46.61	406.61	41.5	64	6.10	7025	4.66	328067	168743	.514			
66					463	48.48	511.48		77	5.07	8560		399752	212264	.530			
67					566	50.35	616.32		93	4.20	10260		479142	255785	.533	.533	4.20	
68					669	52.22	721.22		120	3.25	12525		584917	299306	.511			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE P.

CHUTE No. 6.—*Centre buckets. Inclined above the shaft. Bottom of gate* 3.66 *feet above bottom of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	W't of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pds.	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	19.34	20.40	20.40	1.25	566	48.95	614.95	41.5	31	12.60	4300	23.00	989000	255204	.257			
2					669	50.58	719.58		35	11.16	4825		1109750	298624	.269	.269	11.16	
3					772	52.21	824.21		40	9.77	5650		1299500	342046	.266			The position of this bucket is such that a line parallel to its face, when extended, will pass 15½ inches above the centre of the shaft.
4	13.59	14.65	14.65	1.25	669	50.58	719.58	41.5	31	12.60	5780	17.75	1025950	298624	.291			
5					772	52.21	824.21		36	10.86	6320		1121800	342046	.304	.304	10.86	
6					875	53.84	928.84		41	9.54	7150		1269125	385468	.303			
7	8.34	9.40	9.40	1.00	360	45.69	405.69	41.5	38	10.28	4425	12.00	531000	168361	.316			
8					416	46.59	462.59		45	8.71	4600		552000	191974	.347	.347	8.71	
9					463	47.32	510.32		52	7.52	5100		612000	211782	.345			
10					556	48.95	614.95		67	5.84	6475		777000	255204	.327			
11	8.34	9.40	9.40	1.25	566	48.95	614.95	41.5	39	10.02	6260	12.00	751200	255204	.339			
12					622	50.10	672.10		41	9.54	6650		798000	278921	.348	.348	9.54	
13					669	50.58	719.58		45	8.71	7250		870000	298624	.343			
14	4.34	5.40	5.40	1.75	566	48.95	614.95	41.5	42	9.31	7500	8.00	600000	255204	.425			
15					622	50.10	672.10		43	9.09	7950		636000	278921	.439	439	9.09	
16					669	50.58	719.58		47	8.32	8600		688000	298624	.434			
17	1.00	2.06	2.06	1.75	360	46.61	406.61	41.5	63	6.20	6750	4.66	315225	168743	.534			
18					416	47.62	463.62		70	5.58	7525		351417	192402	.546	.546	5.58	
19					463	48.48	511.48		79	4.95	8350		389945	212264	.542			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE Q.

CHUTE NO. 6.—*Centre buckets. Inclined below the shaft. Bottom of gate 3.66 feet above bottom of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wtofwater expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm of bkt.															
	Feet	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Seds.	Feet.	Pds.	Feet.						
1	19.34	20.40	20.40	1.25	566	48.95	614.95	41.5	29	13.48	4350	23.00	1000500	255204	.255			The position of this bucket is such that a line parallel to its face, when extended, will pass 15½ inches below the centre of the shaft.
2					669	50.58	719.58		30	13.00	4875		1121250	298624	.266			
3					772	52.21	824.21		35	11.16	5475		1259250	342046	.271	.271	11.16	
4	13.59	14.65	14.65	1.25	669	50.58	719.58	41.5	32	12.20	5700	17.75	1011750	298624	.295			
5					772	52.21	824.21		36	10.86	6325		1122687	342046	.304	.304	10.86	
6					875	53.84	928.84		40	9.77	7175		1273562	385468	.302			
7	8.34	9.40	9.40	1.25	566	48.95	614.95	41.5	39	10.02	6370	12.00	764400	255204	.334			
8					622	50.10	672.10		42	9.31	6700		804000	278921	.346	.346	9.31	
9					669	50.58	779.58		45	8.71	7175		861000	298624	.344			
10	4.34	5.40	5.40	1.75	566	48.95	614.95	41.5	43	9.09	7550	8.00	604000	255204	.422			
11					622	50.10	672.10		45	8.71	7975		638000	278921	.437	.437	8.71	
12					669	50.58	719.58		50	7.82	8700		696000	298624	.427			
13	1.00	2.06	2.06	1.75	360	46.61	406.61	41.5	64	6.10	6760	4.66	315692	168743	.532			
14					416	47.62	463.62		71	5.50	7525		351417	192402	.575	.575	5.50	
15					463	48.48	511.48		79	4.95	8360		390412	212264	.542			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

[TO BE CONTINUED.]

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JULY, 1831.

With Remarks and Exemplifications, by the Editor.

1. For improved *Cushions for Billiard Tables;* Abraham Bassford, city of New York, July 20.

Gum elastic, or India rubber, is to be cut into pieces of about an inch square. These are to be fastened to the cushion rail with glue or cement. Great care must be taken that the faces of the pieces are made with perfect truth. The India rubber is afterwards to be covered with leather, webbing, and green cloth. The claim is to the gum elastic stuffing for the cushions of billiard tables.

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2. For bending *Iron Hoops to be applied to the bottoms of Card and Drawing Cans;* John Butterworth, Philadelphia county, Pennsylvania, July 20.

To preserve the tin cans used with carding and spinning machines, their bottoms are to be furnished with iron hoops, the lower edges of which are to be bent inwards so as to form a flanch for sustaining the bottoms of the cans. It is proposed sometimes to tin these hoops, and to attach them to the can by soldering.

To bend the iron hoops they are to be slipped over round blocks of cast iron, of the proper size. The lower edge of the hoop rests upon a shoulder, and its upper edge stands above the block, over which it is to be bent, either when heated or cold.

The invention claimed is the machine for bending the hoops, and also the soldering them upon the cans.

This mode of bending metallic hoops is so obvious and so common that the only marvel about it is that any one should think of taking a patent for it.

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3. For a *Thrashing Machine;* John Vasburg, Kinderhook, Columbia county, New York, July 20.

The patentee tells how his machine is made, and what it will do, and that it may be worked by horse or other power. The whole story has been so frequently told, that to repeat it would be mere prosing, a thing which we do not admire either in ourselves or others. We read of revolving beaters, an apron, and a concave, but they, fortunately, are not introduced as new, no claim being made.

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4. For an improvement in the mode of making *Steam Engine Boilers,* called the 'safety steam boiler;' John C. Douglass, city of New York, July 20.

We gave at p. 226, vol. vii. the specification of a patent for a steam engine boiler, which issued to the same gentleman on the 17th day of December, 1830. The present boiler is constructed under the same theoretical views with his former; views which are at variance with all the well established principles of natural philosophy, and which therefore have led the patentee wide of the goal at which it was his hope to arrive.

We are told that the improvement now offered "is founded on the discovery, that very many, if not all, the explosions of steam boilers arise from the fact that a highly rarified state of steam, or a vacuum, exists within the boiler, at the bottom and lower parts of the boiler." The mode in which this vacuum is supposed to be formed is the removal of pressure in the boiler by the opening of the safety valve, or from any other cause. The steam and foam then ascending to the top, leaving a void space below, the consequence of which will be a collapse of the boiler.

In order to fill up this vacuous space, tubes are to lead into the lower part of the boiler, and to be bent up at the outside to the height at which the water in the boiler is intended to stand. The upper ends of these tubes are to be furnished with valves, which open inwards, so that when there is a vacuum formed in the boiler, the valves may open, and admit either air, or water, as may be desired.

This certainly is the most powerful, and at the same time the most capricious vacuum of which we have ever heard; for whilst it sustains the whole load of water, and the pressure of steam in the boiler, it refuses to keep a valve closed which opens inwards to supply the boiler with air or water.

We perceive but little difference in the assumption and principle, or rather absence of principle, upon which the two patents taken out by this gentleman are founded.

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5. For an improvement in the *Manner of Drawing Soda Water;* Ambrose Church, Canandaigua, Ontario county, New York, July 20.

If the security of a patent depends upon the number of persons who obtain it under the character of being the true and original inventors, the present is perfectly safe, as it has now no fewer than five guardians; see p. 166, 247, and 340, vol. viii. and the next article with the remarks there made. The present patentee says that "the patent is not taken for the composition of the ingredients, but for the mode of drawing the water," which is exactly like those referred to. Water, and the proper ingredients for making soda water, are to be placed in two jars. Now although we know something about soda water, we could not tell what ingredients to put into two jars, which by their union would produce it. We are led to the conclusion, therefore, that it is not soda water, but the common effervescing mixture of the physician, which is to be formed.

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6. For an improvement in the *Soda Fountain;* Noah H. Coleman, Mentz, Cayuga county, New York, July 20.

"Another, and another, and another."

We are here told what ingredients the patentee intends to use, as, into one jar he puts a gallon of ice water, with eight ounces of super-carbonate of soda, and into another seven ounces of tartaric acid, with the water.

Besides these two jars, there may be another containing mead, or "any other liquid" which may adapt the whole to the palates of those who wish for something good.

The apparatus here described is more complex than those of the other patentees, but the design is the same.

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7. For a *Cooking Stove;* Elisha Bates, and David Updegraff, Mount Pleasant, Jefferson county, Ohio, July 20.

This cooking stove has boilers passing through holes in the top, and others with tubes passing through openings in the side; it has also an oven, and various other usual appendages. These are all described at great length in the specification, but there is no attempt in it to point out any thing really new. We have no doubt that when properly managed, it will be a good stove, though not superior to many others.

If a patent can be sustained upon such a specification, it must be upon the particular arrangement exactly as described, for whatever of novelty it may present consists in this.

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8. For *Machinery for Manufacturing Tin Ware;* Edward M. Converse, Southington, Hartford county, Connecticut, July 20.

Those acquainted with the progress made within the last thirty years in the manufacturing of tin ware, know, that with the exception of soldering the work together, nearly the whole of the labour is performed by machinery.

The present patentee has described and figured machinery for turning straight edges—for grooving—for double seaming—for setting down bottoms on vessels—for turning edges for wiring, and for burring.

In their general construction these machines resemble those heretofore known, but with certain alterations which the patentee believes to be improvements; and the whole description of which occupies more than twenty-four pages. He says that they are cheaper, more durable, and perform the work better than any others.

The frame work of his machinery, the wheels, boxes, and most other parts, are made of a compound of zinc, copper, and tin, in the proportion of ten parts of the first, one of the second, and half a part of the third. He mixes these by melting together the copper and tin, to which he adds as much zinc as the weight of both. This mixture is then combined with the remainder of the zinc, in a fused state.

This metal, we are told, is valuable for making a great variety of articles in domestic economy; that it is recommended by its cheapness, and freedom from corrosion, and that it receives a fine polish. The patentee, although he inserts the recipe, does not, we suppose, intend to claim this particular composition as making a part of his patent, as it is a kind of mixture well known in the manufactories of Europe, and in many of our own. He has not, in fact, inserted any claim to it.

9. For an improvement in the *Making of Pasteboard or other Paper;* Frederick A. Taft, Dedham, Norfolk county, Massachusetts, July 20.

The pasteboard, or paper, alluded to, is, we suppose, intended for sheathing, as it is to be saturated with pitch or rosin; and it is the new mode of doing this which forms the subject of the present patent. The pitch, or rosin, is to be finely powdered, and mixed with the pulp of which the paper is to be made. The paper, after being dried, is heated, and passed between hot rollers, which renders it compact.

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10. For a machine for *Excavating and Removing Earth,* called the 'excavator and self-loading machine;' Menoah Alder, and William F. Boyd, Northumberland, Northumberland county, Pennsylvania, July 20.

(See specification.)

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11. For an improvement in the *Grist Mill;* Jehiel W. Dart, Willard Webster, and Hiram Webster, Truxton, Courtland county, New York, July 20.

A suitable frame is made to support the stones, and their gearing. The stones may be about sixteen inches in diameter. The upper stone is stationary, being bolted upon the framing, the lower stone is convex, to adapt it to the upper one. The spindle upon which the runner is fixed, has a step below, and passes through the cap stone into a box above.

"The invention hereby claimed, is the cheapness of the construction of the mill, the grinding surface as before described, and lessening the usual power for grinding."

Cheapness is a very acceptable quality, but, we think, scarcely patentable. Convex and conical surfaces have been before used in such mills, and why the power required for grinding will be less in this than in other mills of the same size, we do not see, and are not told. The difference between this and several other portable grist-mills is so trifling that we are at a loss how to divide the merit of the invention among the three patentees. Using all the light which the claim throws upon this subject, we are led to the conclusion that one of them may have invented the "cheapness," another the "grinding surface," and the third the "lessening the usual power for grinding."

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12. For *Machinery for Cutting Leather, or other substances, into any desired shape, at one operation;* George Domitt, city of Boston, July 20.

The cutting part of this machinery consists of a knife bent into the form of the article to be cut, as the visor of a cap, or the upper leather of a shoe, and fastened to a stock of cast iron, or other suitable material. It is to be forced down by a lever, or any other suitable power.

So far there is no novelty in the invention, as a patent was taken for such knives, or cutters, about sixteen, and again about three, years ago. The present patentee, however, uses a clearer, or clearers, to force the leather out, after it has been cut; for this purpose there are two bolts which slide freely through the stock to which the knives are fixed. These bolts are borne up by spiral springs so as, ordinarily, to stand flush with the inside of the stock; when forced down, these will push the leather clear of the knives. They may be forced down by causing them to touch against a piece fixed for that purpose, as the lever rises after the cutting.

The claim made is, not to any of the separate parts, but to the combination of the whole. As the main principle, however, that of the knives, or cutters, is not new, the particular arrangement here described may be easily so varied as not to interfere with such a claim.

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13. For improvements in the construction of *Candle Moulds;* Timothy J. Dyre, and Anthony Richmond, New Bedford, Bristol county, Massachusetts, July 20.

These moulds are made and fixed in a frame in the usual way, but the lower ends, or tips, of the moulds are to be made of brass, or other hard metal. The upper plate also, upon which the tallow is poured, is formed of hard metal, and the block tin moulds are soldered to it. One side of the frame, which forms the trough round the moulds, is made to slide down, to facilitate the removal of the superfluous tallow. The improvements claimed are the hard metal tips, and the metal plate which receives the upper ends of the moulds.

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14. For machines for *Drilling or Boring Holes horizontally, or vertically, in stone, iron, or wood;* Ebenezer C. Everts, Greene, Chenango county, and William Lockwood, Colesville, Broome county, New York, July 20.

There is to be a sliding frame which works up and down vertically, in grooves. A vertical shaft, with a drill at its lower end, is affixed to this frame, as is also a crown wheel which takes into a pinion on the shank of the drill. The sliding frame is to be drawn down with any desired force, by weights acting upon pulleys. This machine, we are told, may be placed horizontally or otherwise. The substance to be drilled, or bored, is to stand beneath the frame, and when the crown wheel is turned by means of a crank, the article will be drilled.

If it is intended to drill soap stone, such a machine may do well enough, but if sandstone, granite, or any of the hard stones usually employed, are treated in this way, they will refuse to yield, and will grind the steel more rapidly than the latter will cut them. Those persons who have seen stone drilled, know that there is nothing in this process resembling ordinary drilling, as it is performed by repeated blows from a cutting edge, formed like a chisel. We have described more than one machine for this purpose, in which the proper motion was given to the drill by the apparatus, instead of the usual way of working it by hand.

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15. For *Composition Paint;* Philip A. Klipstine, New Baltimore, Fauquier county, Virginia, July 20.

This composition paint is to be made by pouring one gallon of boiling water upon one pound of quick lime, and two ounces of sugar of lead. When the lime has become completely slaked, the mixture is to be stirred, and it is then fit for use. It may be made with less water if required thicker, and colouring ingredients may be added to it, and with them an additional portion of the sugar of lead. It is said, that the cost is about one-thirteenth of that of oil paint, and that it is nearly equal to it in beauty. When exposed to the weather, it ought to be secured by a coat of oil.

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16. For a mode of *Manufacturing White Lead;* George A. Harrison, of the city of New York, July 20.

It is the request of the patentee that his specification should not be published at present.

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17. For a *Thrashing Machine;* Philip Harrington, Petersburg, Dinwiddie county, Virginia, July 20.

There are to be square iron spikes driven into a cylinder so as to stand out one or two inches, "in such a position that they may lean from a perpendicular line falling upon the centre of the cylinder, towards the front part of the machine." This oblique position of the teeth, we are told, causes the machine to operate with much greater ease than it would otherwise do. The spikes are to form spiral rows round the cylinder, and the spikes of the concave are to be precisely similar to those of the cylinder; but there are to be bars, or plates, of iron placed between the staves of which the concave is formed, and projecting inwards so that their edges stand within from one-eighth to one-fourth of an inch of the spikes on the cylinder.

The claims are to the position of the spikes on the cylinder and concave; to the manner of distributing the spikes; and to the thin bars or plates of iron.

Sloping teeth have been before used. Strips of iron have been made to alternate with the teeth of the cylinder, if not of the concave; and the distribution of the teeth does not appear to offer any thing new.

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18. For a *Thrashing Machine;* Ira Crawford, Sweden, Monroe county, New York, July 20.

Another cylinder and concave machine, here presents itself. Iron bars, with teeth, are to extend from head to head of the cylinder, and are to stand obliquely. Whatever there is of novelty in all this belongs to the patentee, the rest to the public.

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19. For *Percussion Locks, and Walking Cane Rifles and*

Pistols; Alvin D. Cushing, city of Troy, Rensellaer county, New York, July 20.

The percussion lock here described is intended principally to be used in walking sticks, the barrel forming the lower part of the stick. The hammer, which is to be borne up by a spiral spring, strikes in the middle of the breech pin. The particular arrangements are very distinctly exhibited by the patentee, but need not be described here. He says that he believes "the whole principle and manner of operation, as applied to percussion, or any other locks, is new, except the mode of discharging it by force of the spiral spring." This may be the case, but a very neat and compact instrument of this kind was made some four or five years since by Mr. Saxton, in Philadelphia, and percussion gun walking canes have been made and patented in England. The whole thing is a matter of curiosity rather than of utility, and ingenuity may devise various plans for arranging the parts, without adding any thing to the stock of instruments of value.

20. For an improved *Truss for Hernia,* called the "Gum Elastic Truss;" John J. Heitzleman, M. D., city of Philadelphia, July 20.

The principal improvement here claimed is the forming of the pad of gum elastic, without employing any covering; thereby promoting cleanliness, as this material is not absorbent, and is therefore kept clean with perfect ease. The strap which goes round the body is furnished with spiral wire springs, and there is some novelty in the adjustment of the metallic plate of the pad to the steel spring. This, however, has already been so varied, that much improvement is not to be expected.

Judging from the matter before us, we have no doubt that this truss is altogether a good one.

21. For making *Lamps of various descriptions and forms out of Wood;* Joseph H. Mather, Saybrook, Middlesex county, Connecticut, July 20.

The drawing and model of this lamp, represent one of the ordinary form, turned entirely out of wood. The only metallic part about it is the plate and tubes through which the wick passes. The cavity, or chamber for oil is to be coated with glue, white lead, varnish, or some other material which will resist the oil, or other fluid to be burnt.

The claim is to the application and use of wood in the construction or manufacture of lamps.

Such lamps will undoubtedly answer the intention very well, as the heat from the wick will never affect the wood injuriously; and when persons become tired of burning oil in them, they will serve to aid in kindling their fires.

22. For *Propelling Boats by Man Power;* Alexander Renoir, New Orleans, Louisiana, July 20.

This is the age of great mechanical inventions. Watt and his successors have applied the power of steam in such a way as to produce the most magnificent results; but it was reserved for the present patentee to discover that if they had understood the proper use of their arms and legs, and had known how to make them operate through the medium of levers, wheels, and pinions, as arranged by him, they might have saved themselves no small wear and tear of brains, have propelled boats against the current without danger of explosions, and without the employment of other fuel than bread and cheese.

One man is to propel the boat as well as to steer it; the former he is to effect by his feet, the latter by his hands. The boat too, if we judge from the drawing, will be no plaything.

There are two treadles near the bows of the boat, upon which a man, (Hercules probably,) is to place his feet, whilst his hands manage two tillers, with their ropes, which extend to the rudder in the stern. The two treadles work two pitmen, or shackle bars, which extend back to two cranks, standing in reversed directions on a shaft which crosses the boat, and extends out to the outer timber of the wheel frame. Upon each end of this shaft there is a fly wheel, and a pinion that appears to have on it about sixteen teeth, which take into cog wheels of, apparently, about six times their own diameter. These cog wheels are also the paddle wheels of the boat, as buckets, or paddles, project out from each side of them, and act upon the water.

The reader is now in possession of the whole contrivance, and the commonest mechanician will perceive that although the man at the treadles may be compelled to blow off his steam, the boat will obstinately resist all his efforts, notwithstanding the *aid* of the fly wheels. His crank shaft must perform six revolutions whilst the paddle wheel turns but once. Should the patentee attempt the voyage from New Orleans to St. Louis, we advise his friends to keep a good look out for him at the Balize. The time of his arrival may be pretty accurately calculated by the passage of drift wood down the Mississippi.

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23. For a *Cooking Stove;* Thomas Woolson, Claremont, Sullivan county, New Hampshire, July 20.

The form of this stove is such as to give it the appearance of two ordinary cooking stoves joined together. One of these parts constitutes the fire place, the other the oven, and surrounding flues; the back plate of the fire place forming one side of the oven.

The claims made are the placing the two parts of the stove, horizontally, side by side; the mode of turning the blaze and smoke round the oven; the arrangement of dampers, by which the blaze may be admitted into the funnel without passing round the oven; and the method described in the specification, of making the fire place in one, or dividing it into two parts, by a moveable plate.

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24. For *Manufacturing Rollers of Cast Iron;* James Wood, city of Philadelphia, July 20.

(See specification.)

25. For *Manufacturing Potash from Wood Ashes;* Ephraim Pearce, Lincklaen, Chenango county, New York, July 20.

Leaches are to be prepared by placing sticks, straw, and quicklime, in the usual manner. They are not to contain more than six bushels of ashes, which must form a stratum of from eight to fourteen inches in thickness. Forty-five gallons of water, containing six pounds of salt, are to be heated to near the boiling point, and half a bushel of unslaked lime is then to be thrown in, which will immediately produce boiling. A bushel of ashes is to be boiled in another kettle with six gallons of water. A bushel of ashes is then to be put into the leach, and upon this three gallons of the boiling lime water are to be poured and allowed to soak in. Ashes are then to be added, a bushel at a time, with six gallons of the lime water after each, until the intended six bushels are in the leach. The remaining lime water is to be poured on, six gallons at a time, allowing it to disappear between each pouring.

Three gallons of cold water are then to be put into the kettle of boiling ashes and water, when a quart or two of slaked lime, and a pint, or less, of salt, are to be sprinkled on; after removing the coals, &c. by skimming, six gallons of this water are to be put into the ley kettle. The remainder, with the ashes, is to be put into the leach; cold water is afterwards to be poured on the leach until the strength is out. This leached liquid is to be put into the ley kettle containing the above named six gallons, and the boiling is then to be effected in the ordinary way; which, the patentee says, will at once produce the best quality of potash. He adds, that ashes, which, worked by the ordinary process, will produce one ton, will, by his method, yield *more than two tons.*

We have been at some pains to give the whole process by which the patentee says he produces a result so extraordinary, as we are altogether unable to discover in it any thing to justify the assertion; nor are we prepared to believe that manufacturers of potash have hitherto been in the habit of throwing away more than one-half of that which is contained in the wood ashes.

26. For an improvement in the *Fly Net for Horses;* Peter Mintzer, city of Philadelphia, July 20.

The patent granted to Henry Korn, of Philadelphia, (see vol. iv. p. 409,) is noticed, and the description of his net inserted in the present specification. The improvements claimed by the present patentee, is the using net work, and tasselling of silk, or other braid, instead of the parts which form the longitudinal straps in the former. The net so made, is said to be lighter and more convenient in use, as well as much handsomer. The difference, however, is very trifling.

There is no drawing of this fly net, but a "specimen deposited in the patent office," is referred to; we apprehend that the specimen might be exhibited in a drawing; and therefore that it ought to have been done, as the law expressly requires a "drawing with written references, whenever the nature of the case *admits* of drawings."

27. For a machine for *Cleaning Grain from Dirt;* Thomas Reese, Jones' Falls, near Baltimore, Baltimore county, Maryland, July 20.

This machine consists, mainly, of a hopper, and rubbing plates, formed of sheet iron, to which motion is given by a crank. The lower rubber forms a plane a little inclined from the hopper, and is similar to the upper one, with the exception of being stationary. We are told in the specification, that the rubbers "are made by punching grooves and ridges in sheet iron, about half an inch deep, eighteen inches wide, and seven feet long, and fastening them on boards." As this description does not appear to us to be very luminous, we have given the exact words.

The claim is to "the before described machine for cleaning grain from all kinds of dirt."

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28. For a *Plough;* Barnabas Thacher, jr. Barnstable, Barnstable county, Massachusetts, July 20.

This plough is to be made upon any known principle; but the beam is to be rendered capable of having its direction altered, either upwards, downwards, or laterally, by means of screws, wedges, or otherwise. The claim is to the making a plough capable of this alteration.

The scratch of a pen, which, under the name of a drawing, accompanies the specification, lends but little aid to the description; the object, however, can be understood without it. We have, more than once, seen the farmer alter the set of his plough on the beam, by means of screws or wedges; but hereafter this will, of course, be forbidden by the present patentee.

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29. For a machine for *Dressing Staves and Heading, and for Jointing;* John B. Tackels, Pomfret, Chatauque county, New York, July 20.

This may possibly be a very good machine, but as the specification, with the aid of the drawing, does not enable us to understand its particular structure, we must pass it by until we receive more light upon the subject. There are to be revolving cutters, fixed somehow, and jointers operating someway, to leave the stave with its required bulge. No claim is made.

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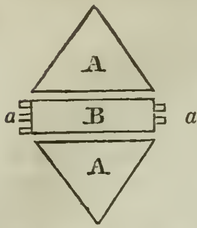
30. For an *Easy Motion and Pavement Saving Wheel,* for Carriages of all descriptions; Felix Varela, of the city of New York, July 20.

We have heard of fortifying a city with leather, and the present invention takes one step towards the carrying this plan into execution, as our pavements are to be defended against the martial attacks to which they have hitherto been subjected by the hard tyre which has surrounded them. Every wheel, hereafter, is to carry with it, *a leather rail road,* altogether novel in its construction, and unique in its appearance.



In the first place the wheel is to be put together without iron tyre, but is to be closely embraced by a double strap of leather. A number of wooden boxes, or rattle-traps, are then to be prepared, by taking two triangular pieces, A A, and one rectangular piece B, equal in width to the thickness of the wheel. Upon the edges of this piece are to be nailed, or screwed, the triangular pieces, which triangular pieces will then stand parallel to each other. These wooden boxes are to be hinged together, at *a*, *a*, so as to form a chain considerably longer than the circumference of the wheel; but not sufficiently so to allow the angles of the boxes to leave the rim of the wheel. Leather is to be nailed upon each of the rectangular pieces B, which surround the wheel, and a continued or endless strap, is to be affixed within the whole of them, by small straps attached to the iron hinges. When one of these is put round each wheel, the system is ready to operate.

The chain of triangular boxes being somewhat larger than the wheel, allows, according to the drawing, two of them to lie flat upon the pavement.

We assure the reader that we are not joking, but have given as honest and exact a description of this truly astonishing contrivance, as we are capable of doing. Should the patentee make a public trial of his invention in the city of New York, he will attract a degree of attention, and acquire an amount of notoriety, which few beside will obtain. As muddy streets are unfavourable to such a concern, we hope the corporation of that metropolis will allow the scavengers to take the lead in the procession.

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31. For a *Machine for Cutting Paper;* Edward Pine, city of Troy, Rensellaer county, New York, July 20.

A knife made of saw plate, or any plate steel, is to be fixed to a frame which works up and down in vertical cheeks. The reams of paper to be cut are placed upon a shifting platform, under the knife, which is to be brought down upon it, by means of a lever. The patentee claims the use of knives so made; the use of lever power in bringing the knife down; the cutting of wet paper, made by cylinder machines; and the use of the machine in cutting paper "not interfering with any other improvement heretofore known or used."

A patent was granted to John M'Clintock, of Chambersburg, Pennsylvania, on the 31st March, 1827, for a machine for trimming the edges of paper; which machine consisted of a knife, brought down by a lever, similar to that above described. This probably may be news to the present patentee, but if the two interfere, as we are convinced they do, the concluding proviso of the claim will not operate as a saving clause.

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32. For a *Press for Cotton and other fibrous substances;* Philenzo Payne, and Joshua Rundell, Port Gibson, Claiborn county, Mississippi, July 20.

This is a vertical press, the follower of which is to be forced down by toggle joints. Within each of the cheeks of the press there is a toggle joint, from the middle of each of which an arm or shaft, extends forward of the press, in a horizontal direction. The power is applied to these arms, to draw them forward, and consequently, to bring the levers of the toggle joints in a right line with each other. The lower sides of the projecting arms form racks, which take into teeth upon a cylindrical shaft, crossing in front of the press. A vertical shaft turns the horizontal one by means of bevel gear. A horse, or other power, may be applied through the medium of a lever, or sweep, to the vertical or main shaft, when the follower will descend. The claim is to the press as described.

We apprehend that this will not be a good press for the purpose intended, on account of the smallness of its range. When a follower is to go but a short distance, and to act with immense power at the end of its range, as in the printing press, the toggle joint offers every possible advantage: but the pressing of cotton, and other light fibrous articles, requires a press with a very long range, as well as of great power, and there are many presses now in use for this purpose, which combine these qualities in a way greatly superior to that now proposed.

33. For a *Machine for Planing Boards;* Joseph Percival, Northern Liberties, Philadelphia county, Pennsylvania, July 20.

If this machine is a good one, it is unfortunate in not coming before us with a favourable introduction. A more inadequate description could not well be given, and although considerable pains have been taken with the drawings, they afford but a very incomplete representation of the details of the machinery. Some of the wheels are called segment wheels, whilst, according to the drawing, there is not one answering to this name in the whole machine.

The cutters, or irons, are, it seems, to be fixed in a frame, and are to operate in the manner of ordinary plane irons, the frame containing them being passed backward and forward over the board, by a chain attached to it. The driving wheel is a large cog wheel, called a large *segment* wheel. This drives two pinions, or small cog wheels, also called *segment* wheels. The shafts of these pinions have wheels upon them, which take into the links of the chain which moves the plane. There is a contrivance for throwing these latter wheels alternately out of gear, in order to change the direction of the machinery.

The whole apparatus is complex, and inartificial; and is certainly very inferior to some of the planing machines previously in use. There is no claim made, the general arrangement being undoubtedly, and, we apprehend, correctly, considered as new.

34. For an improvement in the Machinery for *Winnowing and Cleaning Grain;* Joseph D. Prescott, Chesterville, Kennebec county, Maine, July 20.

A trifling alteration in the mode of working the Dutch wheat fan, as generally used, constitutes the whole of this invention, all that is claimed being a kind of cam shaft, for moving the shoe and sieves, called by the patentee a "re-acting screw shaft," and an arrangement for altering the inclination of the sieves.

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35. For a *Plough;* Albert Peebles, Henry county, Georgia, July 20.

This plough is to be used in the cultivation of cotton, and of corn. It is furnished with two feet, on each of which there is a shovel iron, or a shovel iron on one of them, and the other made in the common form of the share plough.

The *inventor* states that this contrivance was made by him in May, 1816. He has been somewhat tardy in obtaining a patent, and if his neighbours have used it during the interval, which they had a perfect right to do, his claim now will prove something worse than equivocal.

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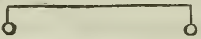
36. For a *Thrashing Machine;* James B. Palmer, city of Baltimore, July 20.

The beaters of this thrashing machine pass from one circular head to another, on a revolving shaft; but they are not fixed immoveably to these heads as is ordinarily done, but each of them works upon joints at their ends, allowing them to give way in passing over the straw after the stroke. To effect this they are bent at right angles at each end, thus,  and a pin, or screw, passing through an eye on the bent parts, attaches them to the drums, near their peripheries, and thus affords them the required play: about six of these beaters, standing two inches clear of the heads, is considered a good arrangement. The other parts of the machine differ but little from those generally used.

It is proposed sometimes to remove these beaters, and to attach to the heads, pieces furnished with spikes, and also to add a concave with spikes; thus converting the machine into the common cylinder thrashing machine. The beaters, as described, are claimed, and also the converting this instrument into a thrashing machine of the usual form, by the alteration above indicated.

We do not recollect having seen moveable beaters constructed and attached in the manner above specified, and think this therefore a valid claim; the second, however, we think altogether equivocal, as it consists merely in converting the original machine of the patentee into one for which he, confessedly, could not hold a patent.

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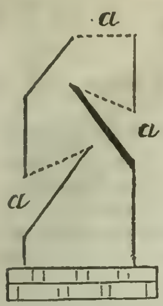
37. For a *Smoke Preventor;* Levi Silliman, city of Albany, state of New York, July 20.

This smoke preventor is an iron chimney cap, intended by its



particular construction to prevent the smoke from being blown down the flue, in whatever direction the wind may be. The mode by which this is attempted to be accomplished is the causing of the wind always to strike upon an inclined plane, by which it shall be directed upwards, and carry the smoke with it. The subjoined sketch, may represent one of the iron plates, with openings at *a*, *a*, *a;* the lower sides of these form the inclined planes, whilst the upper sides, with dotted lines, are unobstructed.

Plates, it is observed, may be fixed in the flue itself, having the required inclination, and openings left in the sides of the chimney will then serve the purpose of the proposed cap.

33. For an improvement in *Fire Places*, called "the inverted arch, or curved mantle, for fire places." Elijah Skinner, Sandwich, Strafford county, New Hampshire, July 20.

This is intended as an improvement upon a plan patented by the same gentleman in April, 1822. He now proposes to form the upper part of the fire place by bending iron or brass plates, long enough to reach from jamb to jamb, so that they shall form segments of cylinders. These are to be fixed with the concave side outwards, the convex sides forming the front of the throat of the chimney, having the same curvature which Count Rumford prescribes for this part. When houses are newly constructed, it is proposed to form these breast pieces of cast iron, which may be built into the brickwork and form its support, instead of the ordinary arch, or iron bar.

We do not perceive in what respect this is an improvement upon Rumford's mode of construction.

39. For a *Cutting and Punching Machine,* for iron, copper, brass, &c.; John Shugert, Pittsburgh, Alleghany county, Pennsylvania, July 20.

This machine consists mainly of the common cutting shears worked either by a double or single lever. That side of the shears which rises is kept in its place against the stationary cutter by a standard in the bench, which standard presses upon the outer side of it, and is capable of being adjusted to it.

The punching part consists of a punch fixed in the upper shear, just in front of the cutters, with a bed piece upon the bench below it. As the lever, therefore, forces down the cutting shear, it will cause the punch also to operate.

"The part of the above machine which the *inventor* particularly claims, is the post and slide at the back of the upper frame, and the power by which it operates." And we think that this is claiming quite enough in all conscience, as nothing is more common than to allow the shank of the upper shear to rise between cheeks; and "the power by which it operates," is universally employed for the same purpose. What has become of the punching part?

40. For a *Machine for Weighing;* James S. Seger, city of New York, July 20.

Without a drawing we cannot give a precise idea of this machine, and although there is some ingenuity in its construction, we apprehend that it will not, to any extent, supersede the usual process of weighing, and shall be satisfied with giving a general idea of it.

The weight of any article is to be indicated upon a flat round metallic plate, which is suspended vertically by a clevis and ring above it. When a weight is hung to a hook, pendent from a clevis which receives the circular plate in a slot, and allows it to play freely, the plate is canted on one side in a degree proportioned to the weight. An index upon the plate, which turns loosely upon a pin, and, therefore, always hangs vertically, points to figures which indicate the weight.

The circular plate, and the loosely pendent index for pointing out the weight, constitute the claims.

41. For a *Machine for making Hooks and Eyes;* James Stewart, formerly of Montrose, in Scotland, but for two years past a resident of the city of Boston, in the state of Massachusetts, July 20.

This is a very complex machine, but it is perfectly well represented in the drawing, and fully described. Machines for the same purpose are in use in different countries, and how this may compare with those before known we are unable to say.

The claim made is to the combination of well known machines, or elements of machines, to produce the intended effect.

42. For a *Machine for preparing Mortar for making Bricks;* Oran W. Seeley, Williamson, Wayne county, New York, July 20.

This machinery, in its general structure, resembles some others now in use for the same purpose. A circular trough is prepared into which the clay is to be put. A horizontal shaft, working upon an upright in the centre of the trough, when forced round, causes wheels to run over the clay, the wheels having a traversing motion to and from the centre. The arms of the horizontal shaft have each a screw cut upon them, these work in the hubs of the wheels, and cause them to traverse; one of them is a right, and the other is a left handed screw; in consequence of which, both the wheels recede from and approach the centre at the same time. Each wheel, instead of having a single rim, has four rims, or sets of felloes, supported by spokes from one common hub, the advantage of which is manifest.

The claims are to the right and left handed screws, and to the particular construction of the wheels.

43. For an improvement in the *Axles of Wheels for Railway Carriages;* Ross Winans, city of Baltimore, July 20.

(See specification.)

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44. For a *Lever Power and Inclined Wheel for Propelling Machinery;* Peter Wykoff, Westfort, Oldham county, Kentucky, July 20.

We have here the ghost of Redheffer's perpetual motion. This sprite, it appears, has been called from "the vasty deep," or elsewhere, has wandered towards the west, and taken up its abode with the present patentee. On revisiting our country he has evidently acquired more confidence than formerly, as he comes forth without that disguise with which he was enveloped in his Redheffer service.

The *inclined wheel* above named, is a *vertical wheel*, the axis of which is horizontal; upon the rim of this wheel a kind of carriage is to be placed, which carriage, as carriages ought to do, rests also upon wheels of its own. As this carriage is placed about forty-five degrees from the apex of the *vertical inclined* wheel, the vehicle will itself be inclined to run down, and fall to the ground. To counteract this inclination, a strap passes round a whirl, or drum, connected with the carriage wheel, and, inclining upwards, embraces another whirl, connected with ratchet wheels and palls, which are to correct its inclination to work too rapidly. To this system of ratchet wheels and palls there are appended various other contrivances to communicate the latent motion which exists in the inclined carriage, in proportion to its load, and which for its development requires nothing more than to cut the strap by which its inclinations are checked.

To the curious who wish for further information upon this subject, we can only give a reference to the files of the Patent Office, as we have, no doubt, already said more about the affair than will accord with the inclinations and anticipations of the *inventor.*

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45. For a *Compound Revolver for Roping Cotton;* Asa Whitman and Joel Baker, Walpole, Norfolk county, Massachusetts, July 20.

This is a very ingeniously contrived apparatus, and one which we have no doubt will accomplish its purpose in a very satisfactory manner. The patentee states that it is not only more simple than the instruments in common use, but that it is operated on with much less power, is more readily adapted to different numbers of roping, and is easily kept in repair.

A verbal description of it, without a drawing, would be altogether unsatisfactory, and therefore we shall not attempt it.

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46. For an improvement in the *Making of Pumps,* for drawing water from wells; Shadrach W. Allen, pump maker, Geneva, Ontario county, New York, July 21.

A pump maker ought to know how pumps have been made; especially such pumps as are familiar to those who are at all conversant with the subject. As, however, we have lawyers who have acquired but little knowledge of law, and doctors who have never studied medicine, we may well excuse the artisan who manifests a want of learning in the history and progress of the arts.

The pump before us has two barrels, and two piston rods, worked by one lever. We are told that "all the interior is of metal, excepting the lining of the valves, the block, and a part of the lever," and that a spring passes round the piston, and keeps the leather covering quietly pressed against the chambers. This pump the patentee avers is superior to any other now in use; which superiority results from its having two chambers and pistons moving alternately in opposite directions, thus keeping up a constant stream. He says, also, that it has less friction than the common pump, and will deliver more water with less power applied.

If there is a common fire engine in Geneva, the patentee may see his two chambers, pistons, and rods, and all of them made of metal; and if he will turn to any good work on hydraulics, he will find that a double chamber pump is no novelty in its application to other purposes. Although he does not specify his claims, the above named are the points most prominently noticed in his description, and we infer, therefore, that these were intended to be the subject of his patent.

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47. For a *Thrashing Machine, and a Horse Power, for operating said machine;* Nehemiah P. Stanton, Syracuse, Onondaga county, New York, July 21.

The thrashing machine is described in the usual terms, applied to this instrument; we have talked about the different parts so frequently, that we are tired of the subject. There, however, is a claim made in the present instance, which is to "the uniting beaters and spikes on the same cylinder with the cast iron concave bed, and the sheet iron cap, and the construction of the dust discharger." All that is said about the dust discharger is, that "there is a feeding table, with a throat to receive the grain, and directly over it a throat to discharge the dust."

The horse power consists of a large horizontal wheel turned by a lever, projecting from its vertical shaft; this is geared to a smaller wheel which turns a horizontal shaft carrying a drum and strap, which gives motion to the thrashing machine, or to any other machinery required to be operated upon. So far all is according to the well established plan of such machines; the novelty of this horse power consists in placing the wheel work under ground, and allowing the main shaft to project up through the framing, the horse walk being above them. A *diamond* gudgeon is to be formed on the top of the vertical shaft, to receive the mortice of the lever by which the horse draws. The claims relating to the horse power are to the running of the gearing below the lever by which the horse draws. The communications from it to the thrashing machine, by bands, ropes, &c. &c. &c., the placing the lever at top, and the diamond gudgeon.

This patent is taken, not only plainly, but confessedly, for two distinct machines, the application of the horse power to other purposes being particularly noticed; they should, of course, have been the subject of two patents; the claims to the two are separately made as to two machines. But independently of this consideration, there are parts of each of the machines claimed, which present no novelty whatever.

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48. For improvements in the *Machinery of the Steam Engine*, parts of which may also be applied to the gates of water mills, canal locks, &c.; William A. Turner, Washington county, North Carolina, July 21.

The present patentee has laboured very assiduously for the attainment of his object, as we have already noticed two patents obtained by him within about four months, each having the same end in view and by means very similar. The first of these is noticed at p. 14, vol. viii. and the second p. 112 in the same volume. The specification before us extends to twenty-seven closely written pages, and to as many of drawings and references, and although several of its propositions now made bear a very near resemblance to, and are indeed identical with those in the patents which preceded it, there are, of course, some novelties presented to us.

The propositions relative to the steam engine are, 1st, to ascertain the quantity of water in the boiler. 2nd. To prevent its overheating. 3d. To open large holes for the escape of steam when necessary, and to force a considerable quantity of water into the boiler at once. 4th. To cause the induction valves to open with great ease.

We can give no more than a brief notice of these various propositions; and, most probably, the greater number of our readers will wish that we had been still more brief.

In order to ascertain the quantity of water, the boiler is to be suspended on a balance, like a scale beam, or it is to be contained on a float, by which both it and its contents may be accurately weighed; there being an index to point out the weight, or otherwise an alarm is to be sounded as it ascends by becoming too light. There is to be an apparatus of wheels, &c. to move the index for pointing out the weight; or when the boiler is made to float in a shallow box containing water, and fitting into it water tight, a tube is to extend upwards, to weigh the boiler, &c. hydrostatically, by the ascent of water from the reservoir.

We have not time, and, to any engineer it would be labour lost, to animadvert on the absurdity of this proposition; not on account of its mechanical difficulties merely, but from the absolute impossibility of carrying it into effect in a working engine. Besides the ascertaining of the actual weight of water, the boiler, as it rises by its levity, is to let go a damper, to check the fire, and at the same time to open certain apertures, which are to pour water on the fuel.

To prevent overheating, the inside of the boiler and flues, in contact with water and steam, are to be coated with such metal as may be found least apt to rust. This, of course, must be silver, gold, or platinum; how this lining is to effect the purpose, we do not perceive. Tubes are to pass entirely through the interior, and the top and bottom of the boiler; in these tubes plugs of fusible metal are to be inserted near to their lower ends: rods are to extend down these tubes and rest upon the fusible metal, and when this compound melts, the rods are to descend, and pull down levers which shut the aforesaid damper, and open apertures admitting a shower to fall upon the fire.

To open large openings for the escape of steam, small valves are to be provided, which are to act upon certain doors, and thus open large holes, for the discharge of the steam, and they are at the same time, like the other contrivances, to close the damper, and to open the holes which are to deluge the fire. We were about to give some idea of the method by which the steam issuing from the small valves, is intended to open the large doors alluded to, but it would require too many words, and we must spare ourselves and our readers this trouble; referring those who wish to know all about it to the specification. We must also take the same course as regards the easy opening of the valves, and the application of the same principle to the gates of water mills, and to the locks of canals. Like the former patents of this gentleman, his propositions are made, without specifying those parts which are new; and the same things are in some instances proposed in each of his patents. Most of his contrivances it is true, have the merit of novelty; we wish that we were able to add, and of utility.

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49. For *Fastenings for Doors and Windows;* James R. Post, city of New York, July 21.

This fastening is a spring bolt. A tube is to be provided which will receive the bolt; a spiral spring is to be put into this tube, and the bolt then passed in over it. In the edge of the lock rail of a door, or the rail of a sash, a hole is to be bored, to admit the tube with its bolt. Knobs are to be applied, to force the bolt back: for this purpose a slot is left in the tube, and a screw hole made in the bolt; a corresponding mortice, or opening, must, of course, be made in the rail, through which the knob may be screwed into its plate, and fly backward and forward.

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50. For an improvement in machinery, called the *Circular Wedge;* Silas Underwood, Hardwick, Caledonia county, Vermont, July 22.

The so called *circular wedge*, here patented, is no more than the common eccentric, so generally applied to machinery. We are told that it is a complete substitute for the crank. It is represented as applied to a saw mill, and also to the beaters of a fulling mill. Were it new, it would be no improvement as applied to the former, and if used to move the latter, it would be but a poor affair. Has the patentee lived in the present day without seeing his *circular wedge* applied to the opening and closing of the valves of a steam engine?

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51. For an improved *Metallic Mould for casting Butt*

Hinges; Jonas Kendall, jr., Watertown, Middlesex county, Connecticut, July 21.

A metallic mould suitable to receive the metal, is made in two parts; these are to be fixed opposite to each other within double levers, which open and close like tongs. The moulds are held together, the metal poured in, and on liberating them, a spring between the levers separates the two parts, and a pin forces the cast piece out, before it has time to cool, so as to harden or break.

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52. For a *Thrashing Machine;* Benjamin Balch, and Luke Webster, Sweden, Monroe county, New York, July 22.

The claim made, is to the placing the iron beaters which surround the cylinder in an oblique direction, alternately sloping different ways. The object proposed by this arrangement has been repeatedly effected.

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53. For a Machine for *Cutting Dye Woods;* Merrit Hurd, Augusta, Oneida county, New York, July 22.

There is a part of this machine, which, in the specification, is called a cylinder; but it is in fact the frustrum of a cone: one of its ends is six, the other ten inches in diameter, and eight in length. This part is made of cast iron, about five-eighths of an inch thick, and with a head or bottom to the smaller end; through this passes a horizontal shaft, by which it is made to revolve. A longitudinal mortice, like the mouth of a plane, is made to receive the iron which is to cut the dye wood, the chips from which pass through to the inside of the cone, and fall out from its open end. There is a rest provided to sustain the wood to be cut; and a weighted arm upon the shaft, to operate as a fly wheel, to give momentum to the cutter.

There is no claim made, the general construction of the machine being considered as new. It is certainly simple, and, we have no doubt, effective.

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54. For an improved *Corn Plough;* Nathaniel Ethridge, George Heath, and Ira Glynn, Little Falls, Herkimer county, New York, July 23.

This is a plough, which consists of several parts, which are made to shift, in order to adapt the instrument to the respective purposes which it is designed to answer.

When the plough is used for ridging and hilling, it has a mould board, which is double, throwing the earth equally each way, and a chip with double wings. There is also an instrument called a drag, which is sometimes connected to the plough by suitable irons. This is used, for example, in the first hoeing and weeding; the mould board being removed, but the share and chip remaining in their places. The drag operates as a harrow, or rake; it consists of two bars of iron, standing obliquely to each other, their wider opening being towards the plough, and furnished with teeth which drag upon the ground.

The claims are to the chip with double wings; the double mould board, made to take off; and the cast iron harrow, or drag.

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55. For a *Thrashing Machine;* Jacob Redifer, Philadelphia county, Pennsylvania, July 25.

The parts of this thrashing machine are the same with those most frequently described; the position of the hollow segment is, however, different from that usually adopted, as it is placed directly over the revolving beaters, or cylinder. The feed board is inclined upwards, so that the straw may pass over the cylinder, and under the segment, which has a cap to retain the grain. The cylinder must, of course, revolve in a direction the reverse of most of those used; and the grain and straw are to be delivered in front, a little above the axis of the cylinder. A rack of wood, or wire work, extends from the front of the machine in an inclined direction, to carry the straw out of the way, and allow the grain to fall through.

The claims are to the position of the feed board, with its highest end towards the cylinder; and to the rack in front of the machine. Our impression is that the claim to the latter is of doubtful validity, as there are machines patented, which thrash and winnow at the same time; the grain and chaff falling through a rack, or screen, in front, and being then operated upon by fans.

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56. For a *Thrashing Machine*, for thrashing rice, and other small grain; Samuel Rogers, Ashville, Buncome county, North Carolina, July 28.

The only difference which we discover between this and the great number of thrashing machines, consists in the ease with which the patentee avers that it operates; for although it is precisely like many others, he declares that it may be worked with half the power usually found requisite. The "why and because" are not given, nor is there any part designated, or claimed, as new.

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57. For a *Brick Press;* Thomas A. Fricks, Harrisonburg, Rockingham county, Virginia, July 29.

There is nothing very special in the construction of this press, to mark its superiority over others previously in use. The brick is placed in a double mould, which is then slid to its place, when a lever, attached to the lower framing of the press, is forced down, and brings a piston to bear forcibly upon the brick; as this lever is brought down, it acts upon another, which raises the brick to the top of the mould. No claim is made.

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58. For improvements in the *Machinery for Cleaning Rags,* used in Paper Making; George Carriel, Manchester, Hartford county, Connecticut, July 27.

A common screen for cleaning rags, used either with or without pins, or knives; is to have wings, composed of thin pieces of wood or metal affixed upon its outside, and extending from end to end, in order to create a wind by their motion. This screen is to be placed in a round case, or chest, a little larger than itself. An opening is left along the whole length of this chest; which opening, if the screen be four feet in diameter, may be about sixteen inches wide. The whole should be in a large enclosure. The rapid motion of the cylinder will carry the dust through this opening. The improvements claimed are the use of the wings, as described; and the case with the opening for carrying off the dust.

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59. For an improvement in the *Running of Stones for Flour Mills;* John Clyde, Fallowfield, Crawford county, Pennsylvania, July 27.

The object of this patent is to secure the particular construction of the spindle, and the step in which it works. The upper stone is to be the runner, the spindle being fixed in it for that purpose, and extending above to a piece of timber in which its upper end revolves. A bolt of iron extends through the lower stone. The upper end of this iron bolt is hollowed out, and forms a step for the running spindle; it is fitted so tightly in the stone as to be raised by a hand pole, attached to the bridge tree, and to be lowered by the weight of the upper stone. The stone is to be propelled by a whirl on its top, with an opening over the eye. The claim is to the spindle and step.

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60. For a *Bee House, and the Cultivation of Bees;* Philip Munch, Putnam, Muskingum county, Ohio, July 27.

The bee house, ten and a half feet long, and four feet deep, may contain three different apartments. It is proposed to place the front of the house towards the east. The house is to stand upon legs, consisting of timber properly framed together. The roof is to slope back, and each of the compartments is to be furnished with a door, two feet long, and two feet wide, to allow of putting a hive into it. This door may be furnished with a pane of glass. The apartments are to be closely planked without and within. Openings are to be left in front for the entering of the bees, and ledges placed along for sheltering them, and for them to alight on. When a hive of bees is placed in one of the compartments, the top of the hive is to be gently removed with the proper precautions. The rooms, or compartments, are cleated round, to sustain small sticks, which, with the cleats, support the comb which the bees will eventually build around the hive, and on to the sides of the compartments. The hive is to be raised from the floor by a block under each corner, to allow a free passage for the bees.

A swarm of fresh bees may, if preferred, be put in without a hive; the great object being to give them abundant room, that they may not be compelled to swarm, as from a common hive. By thus giving them ample space, it is said that many advantages are secured Swarms often perish from their swarming late in the fall, which this plan prevents; the practice of killing the bees is rendered entirely unnecessary, as the comb may be cut out at any time when it may be wanted for use, especially in winter; the bees having ample room, will have no inclination to swarm, and will therefore collect honey much more rapidly than usual.

61. For a *Hoop Split Shaving Machine;* Gabriel Heatwoal, Harrisonburg, Rockingham county, Virginia, July 27.

Splits are first to be made out of white oak, or hickory, in the usual way. The machine for shaving them consists of a bar of iron, or steel, which is fixed upon a bench; and upon this the knife, or shaver, is brought down in the manner of the upper blade of a pair of shears, it working on a joint for that purpose. On the edge of this knife there are notches, the size of the hoops to be shaved. The ends of the splits are fastened upon a drum, or cylinder, in front of, and close to, the knife, which is then closed upon them. The cylinder is turned by a crank, which draws the splits through, and at the same time bends them round the cylinder.

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62. For an improvement in the *Net for Covering Horses;* William H. Horstman, city of Philadelphia, July 28.

This differs about as much from the netting patented by Mr. Mintzer, and noticed at p. 48, as two nets made by the same workman might be supposed to differ from each other, when he determined to make some variation in his pattern. The nets are to be made of braid or cord, of worsted, cotton, or silk. It is to be knotted on the upper part in meshes of about an inch square, but is to have a border more closely woven. There is to be a leather strap in front, running round the breast of the horse, and strings of braid are to hang loosely from its edges. The claim is to this mode of making braid netting for horses.

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63. For a *Bolting Machine to separate Clover Chaff from the Straw;* John Bolton, Harrisburg, Dauphin county, Pennsylvania, July 28.

A bolting box is to be made of thin boards. It may be ten or twelve feet long, either round or polygonal; one of six sides being preferred; it may be two or three feet in diameter. The boards are to be sustained by three bands passing round them on the outside, and are to be bored full of holes about five-eighths of an inch in diameter. The bolt, we are told, may be made of basket work, or of wire. It is to be placed a little inclined, and turned by any suitable means, which will separate the chaff from the straw placed within it.

What this is more, or other, than a common revolving screen we cannot tell.

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64. For an improved *Machine for Breaking Hemp;* William Greathouse, Maysville, Mason county, Kentucky, July 28.

A wheel, or platform, twenty or thirty feet in diameter, is to be fixed on a vertical shaft, so that it may turn freely in a horizontal direction. The outer edge of the wheel is formed of triangular slats placed about an inch apart, and having one angle upwards. Upon this part the hemp to be broken is to be laid. Two or more rollers, or nuts, grooved from end to end, so as to mesh into the slots, are fixed so as to revolve by the turning of the wheel, and to be capable of rising and falling according to the thickness of the hemp beneath them. These may be weighted in any desired degree. They must be so placed as to balance each other on the great wheel.

The claim is to the breaking of hemp by placing it on the slats of this circular platform, and allowing the rollers to act upon it, the shives falling through between the slats.

This machine is much more simple than most of those for the same purpose which we have formerly described; this would be an important recommendation, should it prove equally efficient; we apprehend, however, that it will perform its work in a very imperfect manner.

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65. For a machine for *Cutting, Punching, and Pricking Stirrup Leather*, sursingle straps, &c.; Ira Genung, Newark, Essex county, New Jersey, July 30.

Knives, bent into the proper shape, are to be secured upon a joint, or bed, of wood, with their edges rising a quarter of an inch, more or less, above the wood. Punches, or rows of prickers, may also be fixed in the block, with their edges and points upwards. Upon these, the strap to be cut, punched, and pricked, is to be laid, adjustable side strips keeping it in its place. A driver, or follower, consisting of a piece of wood adapted to the purpose, is then brought down upon the leather. When the leather is to be punched, pieces of lead are fixed in the follower, to receive the edges of the punches. There is no claim made, the whole machine, therefore, must be considered as new.

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66. For a *Thrashing Machine;* Benjamin Maltby, Gates, Monroe county, New York, July 30.

This machine differs from many others in nothing excepting the particular mode in which it is to be put together; a thing which is a mere matter of fancy. The claim is to the operative part of the cylinder, in connexion with the concave, and the manner of stationing the concave and cap to the cylinder.

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67. For a *Churn;* Johnson Mewhinney, Liberty, Butler county, Ohio, July 30.

The body of the churn is to be a box with a semi-cylindrical bottom, the sides straight, and the top square; a shaft, carrying dashers, is to pass through it, and it is to be turned by a cog wheel, meshing into a pinion on the shaft.

Further we need not say, as the individual parts possess no more novelty than does the general construction; and those who have read our lucubrations, for a short period only, will be able to pronounce at once upon this point.

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68. For an improvement in the *Printing Press;* Otis Tufts, Boston, Massachusetts, July 30.

This improvement consists in a mode of forcing forward the bar, or driving lever, which acts upon the progressive levers, or toggle joint; the arrangement of the machinery being such as to cause this to be done in nearly a direct line. It would require a drawing to explain the precise mode of effecting it, but the skilful machinist will, probably, catch the general idea from a short description. The lever with which the pull is made, has two projecting pieces at the head of it, giving it somewhat of a T form; in one of these projecting pieces, there is a friction roller which bears against the face of a piece of metal, which may be cast with, or attached within, the frame, or cheek, of the press. The opposite projection, through the intervention of a jointed lever, forces the pitman forward, upon the progressive levers. We think the arrangement a very good one, and a real improvement on this part of the printing press.

Specifications of American Patents.

Specification of a patent for a Hydrostatic Safety Valve for Steam Boilers. Granted to Thomas Ewbank, *city of New York, August* 27, 1832.

With a Copperplate.

To all whom it may concern, be it known, that I, Thomas Ewbank, of the city of New York, have invented a new safety valve, for the boilers of steam engines, which I denominate the hydrostatic safety valve, and that the following is a full and exact description thereof.

The form of my safety valve may be the same as that ordinarily used, namely, a truncated cone; instead, however, of being pressed downwards in the usual way, it is pressed upwards, by the weight of a column of water, mercury, or other fluid.

In the accompanying drawing those parts which are similar in the different figures are represented by the same letters.

Fig. 1 represents a section of the vessels by means of which the hydrostatic pressure is made. A, is an inner cylindrical vessel, which may be open at top, but is closed at bottom. This is placed within a second vessel, B, which is to contain water, or other fluid, by which the pressure is to be made. It is evident that when the vessel A is placed within the vessel B, and water is poured into the cavity between them, A will be pressed upwards with a force proportioned to the area of the bottom of A, and the altitude of the fluid in the cavity. C is a shallow vessel in which B stands, and is intended to receive any fluid which may escape from B. D, E, F, are cocks placed in B, to regulate the height of the fluid, and consequently to graduate the pressure; say to 50, 40. 30, and 20 lbs. to the square inch. G is a disk of wood, or other light material intended to stiffen the bottom of A, and which may also serve to receive the lower end of the valve rod, each end of which passes into cavities without the use of joints as ordinarily made.

Fig. 2 is a section of the valve in action. H, H, is a tube, one or both ends of which open into the boiler at I, I. The inverted valve seat is seen at J in the upper part of this tube. K, K, are ledges to support the hydrostatic apparatus above the boiler. A piece of plank, or other bad conductor, is usually first placed upon the ledges. The valve L is drilled deeply on its lower side, to receive the rod M, the lower end of which rests on G.

Fig. 3, is a perspective view of the whole apparatus, the graduation by means of the corks being represented by figures.

As the steam in blowing off passes downwards, I usually place a cover on the vessel A, as shown at N, Fig. 4. A hole left in the centre of this cover allows the rod to play through, and a collar, O, formed upon the rod may cover the holes.

Fig. 4, represents a valve in its usual position, this section shows two holes drilled through the valve at P, P. I intend sometimes to drill a number of such holes, to prevent, or lessen, that adhesion which is known to men of science as having been described by Mr. Clement. The same provision is shown at Fig. 5. These holes I intend, in some instances, to connect together by turning grooves on the face of the valve, removing a portion of metal between them.

By the arrangement here described, the danger which arises from overloading the safety valve is entirely obviated, or rendered so difficult, and so palpable, if attempted, as to afford complete security on this score.

I have thus given particular exemplifications of the principle upon which my improved valve operates, not, however, intending to confine myself to the precise arrangement herein set forth, as this may be variously modified, whilst the general principle remains unchanged.

What I claim as my invention is the employment of hydrostatic pressure to close the safety valve; the using of the valve in the reversed position; the passing the ends of the valve rod into cavities prepared to receive them without the use of joints; and the drilling of holes through the valve, as above described, in order to prevent adhesion.

THOMAS EWBANK.

References to the Plate.

Fig. 1. Section. A, the inner cylinder closed at bottom. B, outer cylindrical vessel containing the water. B, lower vessel to receive the waste water from B. D, E, F, cocks to regulate the height of the water.

Fig. 2. Section of the valve in action. H, H, tube opening into the boiler at I, I. J, inverted valve seat. K, K, ledges or brackets which support the apparatus. L, valve. M, valve rod.

Fig. 3. Exterior view. The numerical figures exhibit the graduation by means of the cocks.

Fig. 4. Section, showing N a cover to the middle vessel, and O, a collar on the valve rod, to prevent the steam entering it; holes are also shown as drilled through the valve to prevent adhesion. These

are also shown at P, P, Fig. 5, where the valve is in its ordinary position.

Fig. 6. In this figure the dotted lines show how a tube may be placed to direct the steam upwards.

Fig. 7 shows a glass tube, substituted for the graduating cocks. This tube communicates at bottom with the water in the vessels; it is open at top, is graduated, and protected by a metallic case, with a slat its whole length to allow the height of water to be seen, the graduations being made either on the tube or its casing.

Remarks by the Patentee.

The defects in, and abuses of, the ordinary safety valve, which I have attempted to avoid in this, are,

1st. *The facility of overloading it, and that to any extent.*—This defect is greatly diminished, if not entirely obviated, in the hydrostatic valve; for when the extreme force of steam intended to be used in a boiler is determined, the diameter of A, and depth of B, are regulated to the pressure required, so that when the cavity between them, is *filled* with water, (or whatever fluid they are designed for,) the amount of pressure on the valve is then at its maximum: it cannot be increased: consequently, the elastic force of the steam can never rise higher than is sufficient to open the valves against that pressure.

The cocks are merely to ascertain, if desirable, the force of the steam when *below* its maximum.

2. *The strength of steam required to open the common valve cannot accurately be ascertained.* This arises from several causes, as *the friction of the lever and connecting rod joints;* which, from rust, &c. is often considerable, and cannot be exactly calculated, because not uniformly the same; *the mode of raising the valve by the lever,* which has a tendency to draw the top of it towards the fulcrum, and to move its spindle in an opposite direction to one side of the hole in the guide piece, against which it rubs; *uniting the valve to the lever by bolts* through the connecting rod, increases the evil, because the necessary play of these bolts, and the wear of the holes, prevent the true centre of pressure from being always precisely on the centre of the valve; consequently, the steam cannot raise it perpendicularly, but will influence it in an oblique direction, towards that side on which the external pressure is greatest; this will, of course, move its spindle in a contrary way when it binds itself against the guide piece as above mentioned. Its resistance, in such circumstances, will increase with the increasing force of the steam.

In the hydrostatic valve the whole of these defects are avoided. The bolts and lever are not used at all; and the rod which communicates to the valve the pressure against it, being tapered at its ends, presses only on its central points in countersunk holes; one on the under side of the valve, and the other on a piece of iron or brass attached to the bottom of vessel A. There is no friction in obtain-

Ewbank's Hydrostatic Safety-Valve

Fig. 1.

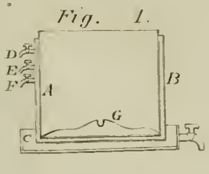


Fig. 2.

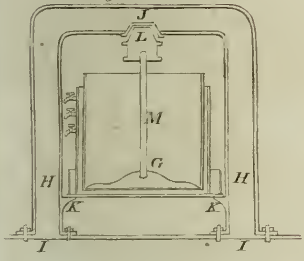


Fig. 3.

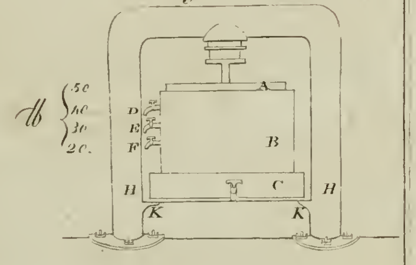


Fig 5

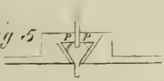


Fig. 4.

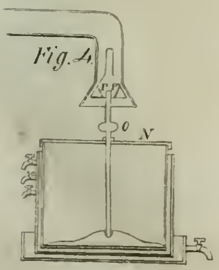


Fig. 7.

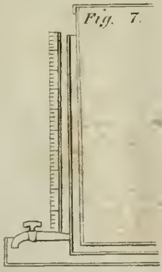
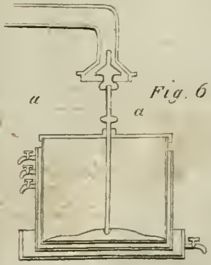


Fig. 6.



ing the pressure on this valve, and nothing to prevent the steam from opening it in a perpendicular direction. It is left freely to its influence.

The *amount of pressure* upon it is also very simply, and most accurately made known, *even to the fraction of an ounce;* thus, when the valve, rod, and vessels, are in their places, water is poured into B till it rises to the brim; then by disconnecting the valve from its seat, and allowing the water to act freely on the inner vessel, this vessel, A, will instantly rise, from the pressure of the water in B. Weights are then put into, (or upon,) A, sufficient to sink it, till the water rises to the brim of B, as before; and the amount of these will be the greatest pressure which can be obtained by it against the valve. In putting in the weights it will be found that when the water has risen near to the top of B, the addition of one-fourth or one-half of an ounce weight, will very sensibly affect it. The same method may be taken in ascertaining the position of the cocks.

In one of these valves, which I have had in use for several months, the action has been surprisingly accurate, and I am not aware of any deficiency in it whatever. I have frequently found that when the steam has risen high enough just to open it, a wine glass of water poured into B, (if not filled at the time,) would instantly close it. The diameter of A is thirteen, and depth of B twelve inches. They are made of sixteen ounce copper, and when B is filled with water, the pressure on the valve is fifty pounds.

3. After the maximum strength of steam intended to be used is determined, great caution is necessary in adjusting the *common valve,* that no more than the relative pressure be permitted to act upon it; yet there is reason to believe that, in many cases, nothing more is calculated than the mere weight *on* the lever; the weight of the valve itself, the rod, bolts, and lever, not being taken into the account at all, although their united weight may be of much importance, especially on small valves. But, in some instances, when they have been taken into the account, (as the foreman of an engine factory informed me,) they were only weighed together, *before being fixed in their places.* That this is a material oversight is evident, since their weight, and the power which they exert on a valve when fitted to their places, are essentially different; thus, a rod, valve, lever, and bolts belonging to a boiler I have in use, weigh together only four pounds, but when in their places, the pressure of the lever on the valve, is upwards of twelve pounds; and as its area is but 1.5 inches, there is a pressure on it, *before any weight whatever is placed on the lever,* of more than eight pounds on the square inch! an amount of too great importance to be overlooked, and more especially where mercurial gauges are not used to correct any errors of the lever.

In the hydrostatic valve it will be seen that all inaccuracies and consequent danger from these sources are wholly prevented *by its inverted position.*

4. The common valve when opened by an excess of steam, may be, and often is, improperly closed before that excess is discharged, either by increasing the weight on the lever, or moving it further

from the fulcrum; (and in this manner the pressure on the common valve may be increased indefinitely, at the pleasure of the attendants,) but the hydrostatic valve cannot be closed at all till the steam has subsided to its prescribed force, when it will shut of its own accord. Indeed the steam must subside a little *below* its extreme force before the valve can be closed again, because by its opening, the vessel A is depressed, which expels a portion of the fluid out of B, and the pressure on the valve is therefore diminished in proportion to the quantity of the fluid so expelled.

5. Common safety valves are generally made so as to be, when closed, level with, or a little above the tops of their seats; in consequence of which, when opened, steam issues from them in nearly a horizontal direction; and "as a strong current of air will be created by the velocity of the steam, and will pass off with it, the surrounding air will follow, and in its course will impinge on the valve, and cause a pressure:" but if the seat be made to project two or three inches above the closing part of it, and *incline a little inwards at the top*, and is of sufficient diameter to allow the steam to escape freely between its sides and the periphery of the valve, the steam would then issue in a column directly over it, and so prevent the influence of any atmospheric pressure whatever.

To derive the greatest advantage from this principle is the design of drilling a number of holes all round the closing part of the valve; which holes terminate on the top in a direction towards the centre. When it is opened, steam will pass through these openings in a quantity sufficient to destroy any partial vacuum that could be formed upon it by the lateral escape of the steam. These holes may be advantageously united by a groove turned around it, through them. It is not material that the valve should be tight to its seat on both sides of this groove; if it is so on that next the boiler, it will be sufficient.

The want of uniformity in the construction of safety valves, chiefly, induced me to propose these holes, to avoid any possible effect from steam forcibly escaping from a small orifice, under a valve or disk, in a radiant or star like form, as discovered by Mr. Clement. In very flat valves, which *overhang their seats*, and such there are, these holes may be serviceable: at the same time, I think it doubtful, whether a properly made conical valve, whose orifice is very little less than the valve or disk itself, would be much benefitted by them, except so far as they lessened the area, and adhesion to that amount, and what effect they might produce on the expansion of the metal and adhesion from that source.

Perhaps there is no part of an engine to which less attention is paid, than to the *proper angles* of the cone, or closing part, of safety valves. They vary, as fancy or caprice directs, from one degree to ninety; from a flat surface to nearly that of a cylinder! I do not know that the most eligible angle has ever been determined, but experience has led me to prefer that of forty-five, or near it; for if it be much less, that is, if it approach much nearer to the form of a cylinder, it would be more liable to adhere to its seat from expansion, or other causes; and if the angle were greater, it would be more subject to the resistance observed by Mr. Clement.

6. It has sometimes occurred to me, that in accurately calculating the amount of pressure on a valve, allowance should be made for atmospheric pressure on the area of its closing parts: thus, a valve which is perfectly fitted to its seat may be turned upside down without separating from it, provided its weight be not equal to the atmospheric pressure on the parts in contact. And as the matter that accumulates on valves soon renders them perfectly tight, if not originally so, perhaps a deduction should be made accordingly. It is said, however, by some persons, that atmospheric pressure has nothing whatever to do with the adhesion of valves, but that they are held to their seats by cohesion, or the mutual attraction of their particles: if, however, the existence of this cohesion depend on the exclusion of the air from between the parts in contact, the pressure consequent on that exclusion must be overcome, *exclusive* of what further resistance is created by cohesion: and again, if cohesion also depend on the immediate contact of the particles of the valve and seat with each other, it is obvious that this can seldom take place, as valves are soon covered with saline and other matters which prevent that contact. But if cohesion were totally destroyed, would not a valve be still subject to atmospheric pressure on the area of its closing parts?

Some valves, as in steam-boats, &c. present an area of the parts fitted to the seats of two square inches and upwards; hence, if my opinion is correct, there is a pressure of thirty pounds from this source alone. But whether this adhesion be caused by atmospheric pressure, or by cohesion, while the effect is nearly the same, there can be no harm in making the calculation in the manner suggested.

The elevation of the hydrostatic valve above the surface of the boiler, and its inverted position, will probably render it less liable to adhesion than the common one, from any other source than that just mentioned. A portion of condensed steam constantly collects above it, and occasionally oozes out, and this circumstance alone may be very beneficial, by preventing the formation, or accumulation, of saline or other substances upon it, and even by lessening, if not destroying, the atmospheric pressure itself.

Thos. Ewbank.

New York, December 1, 1831.

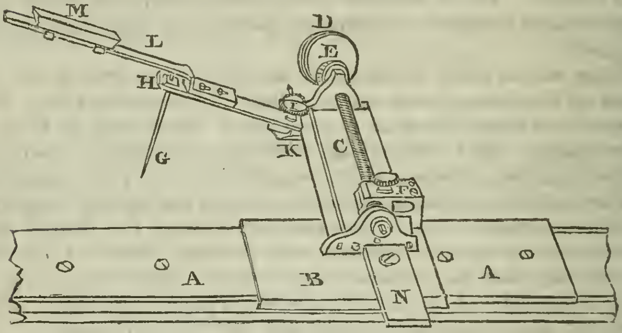
Specification of a patent for a mode of manufacturing Rollers of Cast Iron for laminating or flattening of metals, and for other purposes. Granted to James Wood, *of the city of Philadelphia, July* 20, 1831.

I make a shaft of cast or wrought iron, or of steel, or combinations thereof; upon and around this shaft I afterwards cast iron, so as to form the intended cylinder, or flatting mill roller, of the size, and adapted to the purpose intended. This casting I sometimes effect in one operation, and at other times I complete it in successive operations. The final casting, by which the surface of the roller is formed, is usually made in a *chill*, or mould, of cast or wrought iron, turned perfectly true, and so constructed as to receive and retain the shaft, first named, exactly in its centre. The roller so cast, either chilled or not, may afterwards be dressed by grinding in the usual way, and the gudgeons, if necessary, may be turned. Such rollers may have grooves of various forms made in them, by preparing the *chill*, or iron mould, with such projecting rims, or ridges, as may be required.

What I claim as new, and for which I ask a patent, is the casting of iron rollers, either chilled or not chilled, for flattening or rolling metals, or other substances, upon shafts of steel, wrought or cast iron, or combinations thereof.

James Wood.

Engraving Machine. Invented by Mr. Jobard.



The experimental results of the above invention obtained for Mr. Jobard the large gold medal from the society for the encouragement of arts in Paris, in 1828. It is composed of a brass rule, A, one metre long, upon which slides a socket B, its internal divisions being furnished with flat steel springs. A very fine and closely wormed screw C, provided with a button D, and containing divisions E, is used to space out the lines according to the required distances. It plays in a bed F, which opens, in order that the screw may be returned without loss of time when it has gone its whole length; G is a steel graver, armed with a finely pointed diamond: a small vice H, fastens the point. A button I, furnished at the base with an inclined plane that moves upon a fixed appendix K, serves to keep the point raised when not required for use. A small square bar to which is fixed a cup M, receives leaden weights that communicate delicacy or force to the point of the graver. The piece N is intended to relieve friction of the compartment C; it is attached to the socket or slider B.

Every one knows that it is next to impossible, with manual skill, to cover a somewhat extended surface with parallel lines, preserving a uniform space and consistency. The above instrument we conceive will be found essentially valuable to an engraver; for the only fault with which we can charge the old masters in this branch of art, lies in the inequalities that necessarily exist in the tracing of their grounds, skies, and, above all, in the field of their medals, which, otherwise, were admirably executed. The machine under consideration will remedy this imperfection, and impart to engravings of this class, a precision and velvet-like character extremely agreeable to the eye. It materially lightens the labour of the artist, and, moreover, some descriptions of drawings may be entirely executed by its means.

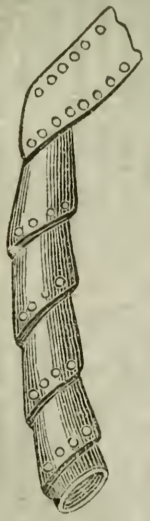
The following is the mode of laying down a sky upon a plate with this instrument. The first line nearest to the horizon is traced with the cup empty; before commencing a second line, a small shot of about a line in diameter is dropped into the cup: this is continued to the close of the operation by adding a shot to every line. The point being thus each time more weighted, the stroke necessarily becomes broader and deeper.—*Recueil Industriel.*

⁂ For machine, architectural, and other drawings of the same character, as well as of still life, the graver of Mr. Jobard will doubtless be found not only available, but useful. For the *poetry*, however, of this branch of the art, (if the reader will allow the expression,) no machinery can convey that enchanting effect of which the hand alone seems capable. We strongly suspect that if all the surfaces in a landscape of *Claude*, or *Gaspar Poussin*, to express which this instrument might be rendered available, were to be laid down with it, the result would be flat, hard and *brassy*. The lines, with all their proportions and graduations would doubtless be found mathematically correct; still we believe that that indescribable charm, that vivid effect, the soul of the art, and which seems to be communicable only by the immediate contact of the hand, would be found wanting. For laying down and shading architectural designs, and mechanical diagrams, we repeat that it may be found eminently serviceable.—*Editor Rep. Pat. Inv.*

Fire Engine Suction Pipes.

Sir,—In some towns in Belgium, the suction hose of the fire engines are made without any internal metal spiral to support them against the pressure of the atmosphere. They are formed, in the manner represented in the following sketch, by winding a broad leather strap round a mandril in a spiral direction, overlapping sufficiently at each coil to allow of a line of copper rivets being inserted.

When the rivets are set very close, and the coils are not above two inches broad, such hose appear to have sufficient stiffness to answer the purpose intended, and to possess some advantages over those generally used in England.



Meteorological Observations for December, 1831.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Dew point	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches.				Inches.	
	1	23°	29°	29.65	29.70	12	NW.	Moderate.		Clear—overcast.
	2	24	35	29.90	29.80	18	W.	do.		Cloudy do.
	3	24	32	29.60	29.60	25	N.	do.		Cloudy do.
⊗	4	24	31	29.50	29.40	26	NW. SE.	do.	.4	Cloudy do. snow in the
	5	10	22	29.60	29.80	5	NW.	Blustering.		Cloudy do. [evening.
	6	10	22	30.10	30.10	5	W.	Moderate.		Cloudy do.
	7	14	22	30.10	30.10	10	W.	do.		Cloudy do.
	8	17	32	29.95	30.00	12	SW.	do.		Cloudy—clear.
	9	26	31	30.00	30.00	15	SW.	do.	.14	Snow—cloudy.
	10	20	30	30.20	30.20	15	NE.	do.		Cloudy—clear.
	11	14	32	30.30	30.30	13	NW.	do.		Clear day.
☽	12	20	20	30.10	30.10	10	W.	do.		Clear day.
	13	15	24	30.5	30.00	5	W.	Calm.		Light snow—clear.
	14	16	24	30.20	30.24	4	W.	do.		Cloudy day—snow in the
	15	16	19	30.20	30.20	8	NW.	do.	.15	Cloudy—clear. [night.
	16	4	22	30.10	29.80	6	SW.	Blustering.		Cloudy—clear.
	17	26	18	29.30	29.40	4	W.	do.		Slight snow—clear—very
	18	6	12	30.10	31.20	3	W.	Moderate.		Clear day. [blustering.
☉	19	16	34	29.90	29.80	11	SE.	do.		Cloudy—clear.
	20	14	22	30.5	30.5	6	SW. W.	Blustering.		Clear day.
	21	22	24	29.60	29.50	14	SW.	do.		Clear day.
	22	16	20	29.90	30.10	1	W.	do.		Clear day.
	23	5	25	30.30	30 30	2	W.	Moderate.		Clear—cloudy—snow in
	24	33	36	29.14	29.14	28	NE. SW.	do.	.40	Cloudy—clear. [the night.
	25	31	35	29.90	29.35	11	SW. W.	do.		Cloudy—clear.
☾	26	21	32	29.73	29.70	15	W.	do.		Clear—cloudy.
	27	19	22	29.70	29.72	6	W.	do.		Clear—cloudy.
	28	26	23	29.50	29.40	18	E. W.	do.	.42	Snow—cloudy.
	29	26	32	29.44	29.44	19	W.	do.		Cloudy day.
	30	12	20	29.80	29.90	2	W.	do.		Clear—cloudy.
	31	14	30	29.50	29.30	22	N. NE.	do.	.19	Cloudy—snow.
	Mean	18.19	26.19	29.83	29.81	11.32				
									1.34	

	Thermometer.	Barometer.
Maximum height during the month,	36. on 24th.	30.30 on 11th & 23d.
Minimum do.	4. on 16th.	29.14 on 24th.
Mean do.	22.19	29.83

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

FEBRUARY, 1832.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Notes of an Observer.—*An examination of some remarks upon the application of water to wheels, which appeared in the 4th volume of this Journal.* *By* James P. Espy.

Dear Sir,—In the Journal of the Franklin Institute, vol. 4, p. 166, there are some very judicious "Remarks upon Water Wheels, and upon some prevailing errors respecting the Application of Water as a Motive Power." But upon reading that part of the essay which relates to our works at Fair Mount, I was surprised to find a disparity between the power and the effect so great as three to one. Upon examining the principles on which the writer proceeded to deduce this unexpected result, I could find no inaccuracy sufficient to justify me in the conclusion that the writer was materially wrong, except in the quantity of water actually discharged upon the wheel in twenty-four hours. The method of calculating this quantity is not given by the writer, and the presumption is, that a due allowance has not been made for the "contracted vein."

According to the experiments of Venturi, confirmed by experiments of the Franklin Institute, not yet published, the area of the "contracted vein" is to the opening in the forebay through which the water is discharged upon the wheel, as 625 to 1000. Now as the velocity due to the head of pressure is at the "contracted vein," and not at the opening in the forebay, in calculating the quantity of water issuing on the wheel, the area of the "contracted vein" must be used.

In making the calculation on this principle, I find that the quantity of water discharged through gate No. 1, fifteen feet by seven and a half inches, in twenty-four hours, under a one foot three and three-fourths inch head, which gives a velocity at the contracted vein of nine feet per second, is about 28,000,000 gallons. Gate No. 3, which is sixteen feet by six and a half inches, gives a little less discharge in twenty-four hours, namely 27,630,000 gallons.

Now if one million and one-third gallons are raised into the reservoir ninety-six feet, above the level of the forebay, by each of these wheels, in a day, with a head and fall of eight feet, the power will be to the effect in the first wheel as one to 0.57; and in the other wheel as one to 0.58; whereas, the effect given by the writer mentioned above, is to the power only as $0.33\frac{1}{3}$ to 1.

The writer has also estimated too high the retarding influence of the inertia of the water put in motion by the buckets with a velocity equal to the difference of the velocity of the bucket, which is twelve feet, and the velocity of the water in the direction of the circumference of the wheel. This difference, on the supposition that the water comes on the wheel one foot from the surface, at an angle of 45°, is $6\frac{1}{3}$ feet.

The whole loss of power, he says, may be estimated thus: "The velocity of the water in the required direction, is that which is due to a fall of $5\frac{2}{3}$ inches.

Immediately on striking the wheel, it receives a velocity due to a fall of 27 inches.

The difference indicates the power expended by the wheel in giving it that velocity, - - - - $21\frac{1}{3}$ inches.

The water comes on the wheel below the surface of the dam, - - - - - - 12 inches.

Total loss, - - - - - $33\frac{1}{3}$ inches.

It appears to me that the following method of calculating is the true one.

The velocity of the water in the required direction, is $5\frac{1}{2}$ feet.

Immediately on striking the wheel, it receives an additional velocity of $6\frac{1}{2}$ feet, due to a head of - - 8 inches.

The water comes on the wheel below the surface of the dam, - - - - - - 12 inches.

Total loss, - - - - - 20 inches.

It may appear paradoxical, and to a hasty examination of the subject, inconsistent with the laws of hydrodynamics, to say that a wheel can move under any circumstances, with a velocity of twelve feet a second, without losing twenty-seven inches of power, which is the head due to this velocity; more especially if the water issues obliquely upon the wheel, as in the present case. But if it is recollected that water produces a greater mechanical effect by gravity than by impulse, the paradox will vanish: for in the case we are now considering, the water, by lying on the buckets while descending eight inches, will, by its gravity, produce as great an action on the wheel, as the reaction had been by impulse.

Thus it appears that there is an actual gain by letting the water on the wheel under a head of less than 27 inches, even at the expense of having to overcome its inertia by impulse: for if the water is let on the wheel under a head of 27 inches, it is acknowledged there would be a loss of 27 inches of the power, even if it could be let on in the required direction. It becomes then a problem worth investigating, at what point it is best to let the water on the wheel, provided the wheel must move with a velocity of 12 feet a second.

I find by making the calculation, that the difference of the loss of power will not amount to two inches in the different heads from three to fifteen inches, and that the maximum is when the water is let on under a head of about nine inches, when the whole loss of power would be 22 inches.

If it were possible to let the water on in the direction of the tangent, the maximum would be under a head of 6¾ inches; for under this head it would issue with a velocity, in the required direction, of six feet a second, and immediately upon striking the wheel, it would receive an additional velocity of six feet, which is due to a head of 6¾ inches; and in this case the whole loss of power would be only 13½ inches, when there would be a loss of 27 inches if it should be let on under a head of 27.

These calculations are made on the supposition of the writer, that the water is received on the wheel at the instant of passing through the gate, which, however, is not the fact; for the lower part of gate No. 1, is 19½ inches below the head, and the water cannot be said to be on the wheel above this point so as to operate on it by gravity.

The middle of the gate is 15¾ inches below the head, which gives a velocity of 9½ feet per second, or about 6¾ in the direction of the tangent; therefore the water on striking the wheel immediately receives an additional velocity of 5¼ feet, which is due to a head of 5⅙ inches, which being added to 19½ gives the whole power lost 25⅔ inches.

This is nearly 26 per cent. of the whole power, and this being added to the 57 per cent. effect before calculated, gives 83 per cent. of the power accounted for; therefore there remains 17 per cent. of the power for waste, friction, and inertia.

By inertia I mean the force necessary to put the water in motion when it is retarded at the bends of the tube. If we suppose that all the retardations which it experiences amount to one complete stop, the loss of power is to be calculated from the velocity of the water in the tube; this velocity is two feet and one-sixth per second, which is due to a head of one inch, or nearly one per cent. of the whole power. If the velocity in the tube were double, the loss of power would be four times as great for one stoppage, and in general the loss of power from inertia is directly as the number of stoppages multiplied by the square of the velocity.

J. P. Espy.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

An inquiry into the probable influence of the Dew Point upon Health.

By James P. Espy.

It appears by the meteorological journal for December, that the "dew point" has been very low, its mean for the whole month, being 10°. Fah. ranging from 4° below zero to 28° above.

Whether the influenza, which has prevailed during that period was caused by the extreme dryness of the air, and consequent rapid abstraction of moisture from the lungs, can only be determined by numerous observations. It is not unreasonable to suppose that some effect is produced on the human system by the great difference in the quantity of vapour exhaled from the lungs at different "dew points." It is the prerogative, and I may add, the duty, of the physician, to investigate what that effect is. Having the subject before me only as a meteorologist, I shall not encroach upon that prerogative; yet as "the sciences are of a sociable disposition, and flourish best in the neighbourhood of each other," I hope what I have to say, will aid, as well as stimulate, the physician, to investigate the phenomenon, as connected with health and disease.

I shall proceed to show that 5446 grains, (about three-quarters of a pound avoirdupois,) of water, are evaporated from our lungs in twenty-four hours, when the dew point is 0°, more than when it is 74°, the highest it rose during the summer.

According to the latest and most approved experiments, a man, at a mean, makes twenty inspirations in a minute, drawing in forty cubic inches of air each time, therefore the number of cubic inches inspired in a day will be 1152000. Now, when the dew point is zero, according to the experiments of Gay Lussac and Dalton, 1152000 cubic inches of air, contain 518 grains of vapour. This, therefore, is the quantity that enters the lungs in a day with the air inspired. If this quantity be subtracted from the whole quantity expired, the remainder will be the quantity actually evaporated from the lungs.

The dew point of the breath at all seasons, as any one may know by breathing on a tumbler of water, is 94° of Fah. and the number of grains of vapour in 1152000 cubic inches of air, when the dew point is 94°, is 10828. Subtract the 518 grains which are inspired from the 10828 expired, and the remainder, 10310 grains is the quantity actually turned into vapour in the lungs, when the dew point of the atmosphere is zero; equal to 1.473 pounds avoirdupois.

Again, when the dew point in the summer is 74°, the 1152000 cubic inches of air, which are inhaled in a day, contain 6004 grains of vapour; but as the dew point of the breath in summer is the same as in winter, namely 94°, if we subtract the 6004 grains inspired, from the 10828 expired, there will be left 4824 grains, the actual quantity turned into vapour in the lungs when the dew point of the atmosphere is 74°, and this, as was mentioned above, is 5446 grains less than the quantity evaporated when the dew point is zero, and is a little more than three quarters of a pound avoirdupois.

It will be seen also, by examining the calculation made above, that the quantity of moisture taken into the lungs in a day by inspiration is nearly twelve times more when the dew point is zero, than when it is 74°. The exsiccating power of respiration in the former case must be very great.

The refrigerating power of respiration due to vaporization alone in the lungs, may be thus estimated. It is known by experiment that water, at all temperatures, absorbs one thousand degrees of Fah. in turning to vapour, and that ice, at thirty-two, absorbs in melting one hundred and forty degrees; therefore if the 1.473 pounds of water which are evaporated from the lungs when the dew point is zero, be multiplied by one thousand, and the product be divided by one hundred and forty, the quotient will be ten, the number of pounds of ice at thirty-two which would be melted in a day, by the caloric given out by the lungs employed in vaporization alone; a quantity which would be sufficient to raise 15¾ pounds of iron from zero to 800 of Fah.

If to this be added the quantity of caloric given out by the lungs in heating 1152000 cubic inches, or fifty two pounds of air, employed in respiration per day, from 55 to 98, supposing the capacity of the air expired the same as of that inspired, viz. 0.26 of that of water, it will be sufficient to raise four pounds of iron from zero to 800° Fah., amounting in all to 19¾ pounds.

As the experiments, however, on the capacity of air expired from the lungs are not decisive, the latter calculation can only be considered hypothetical.

If the capacity of the air expired, as Dr. Black thought, is greatly less than that of the air inspired, caloric might be given out from the air in respiration; but later experiments do not confirm this theory.

When the air is extremely dry, which it must be when it is extremely cold, may it not be important to our health to guard against its drying influence on our bodies, by evaporating water in our parlours?

May not the pernicious influence of those winds which blow over the dry sands of Arabia, be caused as much by their dryness, as by their heat?

Why does the camel, when he feels the withering influence of those winds, thrust his nose down in the sand? May it not be, in part, to obtain a moister air to breathe, as well as to avoid the fine sand carried in the wind? If so, the traveller might obtain security by breathing through a moistened sponge.

How is the economy of nature to be explained in causing us to evaporate more moisture from the lungs in winter than in summer? Or is it intended that we should raise the dew point in our parlours as we do the temperature, by artificial means?

These questions can only be answered by a long course of experiments, but the solution will amply reward the most patient investigation.

J. P. Espy.

FRANKLIN INSTITUTE.

Extracts from the Report of the Judges appointed to examine the Cotton Goods deposited at the Seventh Exhibition of the Franklin Institute in October,* 1831.

The display of prints this year, although not extensive, was sufficient to show that this important branch of the cotton manufacture is steadily improving, and promises ere long to rival the best productions of foreign markets. Calicoes were exhibited from the different establishments of Andrew Robison, *P.*, Everett & Goddard; the Merrimack, Taunton, Fall River, and Eagle Print Works. The quality of the goods manufactured at several of these concerns is too well known to require the special and particular notice of the committee, and they therefore remark generally, that the colours appeared to be good, and the printing executed with neatness and accuracy. The dark chintzes exhibited by the Merrimack Company were much admired for their style and beauty; but the committee were of opinion that the premium should be awarded to those of Andrew Robison for their fineness, colouring, and elegance of execution.

The two blue prints from the Eagle Works, *P.*, were the best and finest exhibited, and the committee consider them entitled to the premium offered by the Institute for this article.

Of furniture chintzes there was a deficiency in the quantity exhibited, but the samples from the Merrimack Manufacturing Company were sufficient to show that with the same taste and skill which they display in their other fabrics, they may also excel in this article.

The committee pass over the sheetings and shirtings from the manufactories of J. & B. Marshall, Philip Allen, Slater's steam mill, Robert Rogerson, and J. Fisher, with the remark that the samples generally were creditable to the makers, but that if any preference is to be given, it should be awarded to the Messrs. Marshall for the evenness, regularity, and excellence of their fabrics.

Samples of cambric muslins were exhibited from the Rockland Manufacturing Company, J. & B. Marshall, and Philip Allen. The

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* In publishing extracts from the reports of the judges appointed at the last exhibition, the committee on premiums and exhibitions desire it to be understood, that the gentlemen whose names are attached to the several reports, are alone answerable for their contents. The committee have, in almost all instances, adopted the suggestions of the judges; in a few cases, however, information that was in their possession, from other sources, has induced them to alter or omit some of the decisions. In such instances, the committee have acted upon their own responsibility, and in all cases, without any intention to cast the least slight upon the judges, whose able, kind, and disinterested discharge of arduous and responsible duties, is fully appreciated by the committee, as well as by the Institute and by the public at large. It will be no cause of surprise if a few expressions of individual opinions, somewhat inconsistent with the general views of the Institute, should occasionally be found in reports necessarily drafted in the hurry of a crowded and highly popular exhibition, by gentlemen, some of whom not being members of the Institute were but imperfectly acquainted with its peculiar objects. The letter *P.* indicates the award of a premium; those of *h. m.* of an honorary mention.

Institute, aware of the importance of encouraging the manufacture of this article, offered a premium for the best sample of $\frac{6}{4}$ cambrics made of yarn from No. 40 to 120, but the committee regret that the quality of those exhibited did not, in their opinion, entitle them to the premium.

Checks were exhibited by the Pennsylvania Institution for the Deaf and Dumb, by A. Clegg and James Rennie. These samples were all of good quality, and their colour the best indigo blue; but in point of beauty, fineness, and finish, a piece manufactured by C. Vancourt, (*h. m.*) one of the pupils of the Institution aforesaid, was deemed worthy of special commendation.

Of tickings the exhibition was not large. Samples, however, were noticed from the manufactories of J. Stetson, the Taunton and the Assanpink companies, all of which were good of their grades, and creditable to those who made them.

The manufacture of Canton flannels, both white and coloured, is annually increasing, and as it consumes a large portion of the raw material, the committee deem it worthy of particular encouragement. They were pleased therefore to find that the Institute had offered a premium for this article, and having examined the samples made by the Blockley Works, *P.* Dennis Kelly, John Waters, and Joseph Ripka, they recommend that the medal be awarded to the former.

Of coloured cambrics, a considerable quantity of which is now annually consumed, no samples were exhibited except from the manufactory of Joseph Ripka. His black cambrics were beautiful specimens of this article, but the pinks, and other colours, were deficient in brilliancy, and in this respect inferior to the imported.

In pursuing their examination of cotton goods, the committee observed with much pleasure several samples of canvass from the manufactory of John Colt, *P.* the character of which, for strength, durability, and usefulness for maritime purposes is now well established, and is eminently deserving of public encouragement.

Samples of ginghams were exhibited from the manufactories of J. H. Roe, Jno. Steel, *P.* and Huster & Buchanan, which, although evincing a state of improvement in this branch of the cotton manufacture, are yet far behind those imported from abroad. The committee are of the opinion that Mr. Roe's samples are the best, but the quantity not being sufficient to entitle him to the medal, they recommend that if it be awarded at all, it be given to J. Steel, whose exertions as a manufacturer deserve encouragement.

The American nankeens manufactured by Collet & Smith, *P.* from cotton produced on the plantation of J. Forsyth, *P.* of Georgia, were examined with much pleasure, because their colour is said to stand the severest tests, and in that case they bid fair to become an excellent substitute for the India nankeens.

Samples of cotton drawers and hose, made by the Newburyport Hose Manufacturing Company, *P.* being the first of the kind exhibited here in any quantity, claimed the special notice of the committee, as being substantial and well made, and as constituting another branch of cotton manufacture in this country.

Of cotton counterpanes a description of goods of which large quantities are annually imported, and the manufacture of which, therefore, in this country, should be specially encouraged, but few samples were exhibited. Those manufactured by William Robinson were of good quality, and the one exhibited by Miss Richardson was a handsome specimen of female ingenuity.

The Britannia handkerchiefs exhibited by J. F. Simmons were handsome samples of our improvement in this branch of manufacture, but not being square are liable to the objection so often urged against those which are imported, and are therefore precluded from receiving the premium which had been offered.

The committee believing that the establishment of manufactories for cotton goods in the southern states will promote their interests, were much pleased to observe samples of blue brochelles, made at Richmond, in Virginia, by Cunningham & Anderson, *P.* These goods are well calculated for cheap wearing apparel, and being stout and well made will supply a desideratum.

The Marseilles vestings from the Rockland Manufacturing Company, although coarse, are worthy of notice as being the first of the kind exhibited at the Institute, and as affording an earnest of greater improvement in this species of manufacture.

Samples of Rouen cassimeres, cotton diapers, and fancy curtain muslins, were exhibited by Joseph Ripka, whose skill and enterprise as a manufacturer of various descriptions of goods, are too well known to require any special notice from this committee.

The jaconet handkerchiefs made by J. Smithurst, *h. m.* are entitled to encouragement, but if his exertions were applied to the production of a finer article, they would be more likely to be crowned with success.

As connected with cotton goods the committee beg leave to express their approbation of two copper rollers, designed for calico printing, from the manufactory of Messrs. Merrick & Agnew, and one from the shop of Mr. M. W. Baldwin. These gentlemen are well known as mechanists, and the different articles of their manufacture, the committee believe, are among the best made in the country.

In concluding this report, the committee cannot but regret that its length, already too extended, prevents them from noticing particularly several quilts, bed spreads, shawls, and other articles, the production of female skill and ingenuity, which were much admired for the beauty and taste displayed in their fabrication.

JNO. B. TREVOR,
WILLIAM NORRIS, JR.
GEO. L. OLIVER,
DURDEN B. CARTER.

Extract from the Report of the Committee on Woollens.

The undersigned, a committee of judges appointed by the Franklin Institute to examine and report upon such woollen goods as should be deposited at their Seventh Annual Exhibition, with a view to award to those deserving of them the premiums offered in their printed circular. make the following report, viz:

No. 237. Four pieces blue satinets, from the Rock Manufacturing Company, deposited by Hacker, Brown & Co., the only lot of blue satinets exhibited; these are a very superior article, and an excellent specimen of the perfection to which this manufacture has been brought. The committee feel somewhat surprised that there should have been no competition for the premium on this article, knowing as they do, that there are many other manufacturers who produce the same description of goods.

No. 188. (*h. m.*) Five pieces mixed satinets, manufactured by Houston & Greene, Groveville, deposited by the makers. We consider this the best specimen of the article exhibited; the mixtures are remarkably well done; the fabric is strong and well cleaned from all impurities and imperfections.

No. 216. The eight pieces mixed satinets from the factory of S. Shove & Co., deposited by J. & M. Brown & M. D. Lewis, are of stout fabric, and show a handsome variety of colours. We observe no particular improvement in their manufacture; they have always had a fair reputation in the market, which is fully sustained by the lot now exhibited.

No. 397. We noticed one piece of olive satinet made by N. E. Russell & Co., Greenfield, Massachusetts, deposited by Fales & Lathrop; it is a good specimen.

There were no satinets exhibited to obtain the seventy-first premium on the printed circular.

No. 91. One piece blue cloth, No. 9168, 22¼ yards, not stated where, nor by whom, manufactured;* it is a fair specimen of well dyed and well finished cloth, and the best piece exhibited.

There were three pieces of black cloth exhibited of nearly equal value to the blue, but with nothing in their finish or fabric deserving of particular notice.

No. 101. Three pieces blue cloths from the Salmon Falls Manufacturing Company, deposited by C. C. Haven, and labelled at $3 per yard; this is a stout fabric and pretty well finished article, but as we understand cloths are declining in value, it appears that this is made of coarser wool than should be put into cloths of that value, even at the present advanced price of the material; the colouring in some of the pieces is imperfect; this was the only specimen offered at the price.

No. 110. Two pieces fancy coloured cloths, 30¾, deposited by Lewis & Whitneys, manufactured by the Great Falls Manufacturing Company. These were well made and handsomely coloured and finished; we consider them a handsome specimen of American cloth, and deserving of notice—we did not see any other fancy cloths worthy of particular observation.

No. 23. *P.* One piece exhibited out of a parcel of ten pieces mixed cloth, from the Oxford Manufacturing Company, deposited by C. C.

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* Since ascertained to be by the Glenheim Manufacturing Company; it was deposited by C. C. Haven.

Haven, said to be of American wool, it is the best specimen of cloth we were called to notice, and will vie with any of foreign manufacture as to texture, finish, and mixture, in all of which it bears ample testimony to the skill and ability of the maker.

No. 143. Three pieces Rouen cassimere, cotton and wool, from the well known manufactory of Jos. Ripka; this is a superior article of the kind, and deserving of notice.

No. 111. *P.* Five pieces merino cassimere, manufactured at Lowell, Mass. by the Middlesex Company, made of cotton and wool, in imitation of the British article of same description; we consider them the best specimen of men's summer wear exhibited; they are in every respect equal to the imported article, and we are highly gratified to witness the great perfection both of texture and finish, as well as the superior style of putting up, exhibited in this lot, which we think deserving of every commendation.

No. 141. *P.* One piece green summer cloth, cotton and worsted, manufactured by Joseph Ripka, *the only imitation of the English of this description we have ever seen;* we think the manufacturer deserving of especial commendation and notice, as well for this particular article, as for his manufactures in general, which stand deservedly high in all the markets of the union.

No. 53. *P.* Four pieces white gauze flannels, manufactured by J. & T. Kershaw, Blockley, Pennsylvania. This is the finest specimen of American gauze flannel which has ever come under our notice; the wool is of the finest description, and the goods are remarkably well made, but they show rather a bluish tinge in the colour, which should be obviated in any future manufacture of the article; we could not ascertain whether the wool was American or foreign.

No. 22. *P.* We noticed with much pleasure the great variety of flannels from the Salisbury Manufacturing Company, deposited by C. C. Haven; they exhibited all the different kinds and qualities made by this company, and show a decided improvement in their manufacture, *we consider them in every respect equal to the imported article*, and entitled to especial notice; the scarlets were particularly brilliant and rich in colour.

There was not a single piece of baize exhibited, we know that this article is extensively manufactured, and are surprised that there was no competition for the premium. These remarks will also apply to drab cloths, of which there was no specimen exhibited.

No. 24. *P.* Two pair white Mackinaw blankets from the Buffalo Manufacturing Company, deposited by C. C. Haven; it is the only parcel of this article exhibited; it is a fair specimen, and shows the ability of the manufacturer to make a blanket which will in all respects compete with the foreign article; it is a branch of trade deserving of encouragement, and although we do not perceive any particular improvement in this specimen over others which we have seen in previous years, yet we cannot withhold our assent to its superior quality.

No. 469. (*h. m.*) The same remarks will apply to the other parcel of blankets, called "bed blankets," from the same manufactory; this is a twilled article, and we think *equal to the best English blankets.* We have again to express our regret that there was no competition for the premium offered for this description of goods; and also that there was no exhibition of common point and bed blankets, an article of such general use, and one almost of necessity.

The foregoing are all the articles of woollens which have come under our notice worthy of particular observation, we have bestowed upon them that careful attention and examination which their merits severally deserved and required; the impartial result of which we have now laid before you.*

THOMAS ROBINS,
JOHN SITER,
W. WURTS,
JAMES BOGGS.

Extracts from the Report of the Judges on Silks and Lace.

The committee on silks and lace, report:

That they have examined the several lots, or parcels, of silk, included in the late exhibition, and present the following as their judgment in regard to the object of their appointment.

The committee cannot refrain from expressing their deep regret at the limited display of silk which has been made; the more so, as not a single lot comes within the list of premiums.

The specimens of manufactured goods deposited by J. Ripka, and the several lots of thrown silk represented by the Nos. 447 a 449, inclusive, also deposited by him, are deserving of particular notice. The piece of black plush, (No. 146, *h. m.*) which it is believed is made of American silk, is a beautiful manufacture, and superior to the piece of drab, (No. 361,) made out of imported silk. Of all the articles to which the attention of the committee was drawn in the discharge of their duty, this piece of goods seemed to claim a preference; whether the quality of the silk, the excellence of the manufacture, or the colouring, &c. was considered, there was found ample cause to applaud the hand that had been so successfully employed in producing an article which might well compare with most, if not all, that the committee has seen of European manufacture.

In relation to the silk prepared for weaving, alluded to in the preceding, the committee are not so well acquainted with the nature of silk in that state as to speak of it in the same confident manner.

The sewing silk and riband, Nos. 59 and 60, which are represented to have been manufactured at the Shaker village, in Mercer county, Ky. are very good. The former is an excellent texture, well coloured, and possessing a fine lustre. It is decidedly the best specimen of the kind that we have yet seen exhibited. The piece of riband is also the best that we have ever seen of American manufacture. Lot 57 is deficient in quality and colour. Lot 363, also of sewing silk, is a good colour, but uneven texture, and not strong.

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* Col. Jno. E. Colhoun, of Pendleton, S. C., sent two blankets made at the manufactory lately established by him on his plantation; they were delayed at sea, and not received till the last day of the Exhibition; but having been examined, after this report was drawn up, were found worthy of receiving a silver medal. Those blankets have a cotton warp and a woollen filling.

Lot 330, piece of black silk vesting, is made from imported silk, the quality is fair. Lot 275, samples of silk hose, are good quality, but made from imported silk.

The other articles do not claim special attention, excepting the cocoons, and the committee can only add their expression of pleasure in seeing so interesting an evidence of the adaptation of our country to the culture of the mulberry and raising of the silk worm. The committee have been much gratified in viewing the parcel of cocoons deposited by Mr. Duponceau, and which were produced upon the farm of the Hon. H. Bry, Monroe, Louisiana.

The cocoons from worms fed on the new species of Mulberry, which were received from Mrs. Parmentier, Brooklyn, L. I. are very fine; the silk is of good texture and soft.

Lot 58. One box cocoons from worms fed on native mulberry, from Mrs. Dinsmore, Cincinatti, Ohio. The cocoons are hard and firm, but the silk is not so fine and soft as the other specimens.

No lace goods being exhibited, the committee have nothing to say respecting that part of their commission.

Respectfully,
Caleb Cope,
R. Colhoun See.

Extracts from the Report of the Judges on Hardware.

The committee of judges on hardware respectfully report:—

That they have attended to the duties assigned them, and now offer to the consideration of the managers their observations upon the various articles belonging to their department.

No. 1. *P.* The handsome specimens of Britannia ware from the Taunton works, are well worthy of particular attention; the quantity exhibited, and the workmanship of the article, together with its silvery appearance, display in bold relief, its near approach to the more costly metal.

No. 44. An iron candlestick, a good substantial article, will compare with the English both in quality and price.

No. 68, is a number of sad irons, from Arnold & Bacon, Rhode Island; these are good wares, possessing in a great degree the qualities which have distinguished the celebrated Colebrookdale Company's English irons.

No. 69. The cast iron vices were noticed in the last report; it was then remarked that trial alone would enable us to come to a proper conclusion as respects their being merchantable; sufficient time has not elapsed to make them generally known.

No. 70. Specimen of wire appears of a good quality, but as the quantity is small, being about two pounds, and as two hundred pounds are required to be exhibited to obtain the premium, it must be passed by without further notice.

There are several specimens of japanned ware, which though exhibiting the fact of an ability to manufacture this description of goods to a great extent, still lack the fine finish of the English article.

The edge tools from Springfield, Massachusetts, are certainly goods of a very superior make and finish, and though the maker has to obtain for them a high price, we understand he is not enabled to supply the demand. Dunlap, Madeira & Co. have exhibited samples of their edge tools, which, though not entering into a comparison with the Springfield goods as respects fineness of finish, are a very merchantable article, and we have reason to believe them to be of a good quality. The locks made by Day & Shawk, (*h. m.*) and by M. Kates, (*h. m.*) have been noticed in a former report; but the year which has passed has given to some of the committee an opportunity of testing their quality in the using; they have established an incontestible evidence of their superiority over any other kind of lock ever imported into the country. There is, however, room for improvement in the lackering. The screws from Phillipsburg are merchantable goods, but have not yet established such a reputation as to fully compete with the English. The samples of bell metal kettles exhibited show that the article can be made, but a great improvement must take place in the weight as well as finish, before it takes the place of the English article. The planes display good workmanship and improvement over those formerly exhibited, but the irons being English, it cannot be called exclusively an American article. In approaching the button department, your committee cannot but express the pleasure derived from viewing the beauty and variety of specimens exhibited by the enterprising and spirited makers, J. M. L. & W. H. Scovill, (*h. m.*) and Robinson, Jones & Co. (*h. m.*) This department fully exhibits the power and force of American industry when properly protected; they have almost wholly excluded the English article from the market, making a home market for the consumption of a part of the most valuable of metals.* As it is, we believe them to be unrivalled in all the qualities which constitute a manufactured article, and too much praise cannot be bestowed upon the goods as exhibited by the above named makers. Your committee cannot think of eulogizing one in particular when so much is justly due to the other; they therefore submit to your consideration the propriety of your particularly noticing both. The few samples of pearl buttons exhibited are good articles, and would compare with the English in quality. There were a number of other articles exhibited in this department, such as saws, shovels and tongs, &c. &c. but as they have been noticed before, your committee deem it unnecessary for them to say more, than that such improvement is evidenced, as must ever be the case in a happy country. In closing this report, your committee must express their gratification at the handsome manner in which the enterprising manufacturers in this department have stepped forth to enrich the seventh exhibition of the Franklin Institute.

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* The great improvement within the last year has given them the most permanent footing.

Respectfully,

Jno. Goodman,
Geo. Handy,
Allen R. Reeves,
Thomas C. Price,
Geo. Abbott.

Report of the Judges on Philosophical Apparatus.

The committee on philosophical apparatus report, that they have examined the different articles submitted to them. They regret that no article competing for either of the premiums for mathematical and philosophical instruments, was offered. They were struck, however, with the beauty of execution of a self-registering thermometer, (for heat) made and deposited by J. Fisher, (*h. m.*) of Philadelphia. A surveying instrument, by W. J. Young, also attracted attention for its general usefulness and neatness of workmanship.

The committee would respectfully suggest as a matter of record, the providing a premium for accurately made thermometers, self-registering, as well as those of the ordinary kind, suitable for meteorological observations.

Hartman Bache,
A. D. Bache,
Jos. Roberts, Jr.

Philadelphia, October 6, 1831.

Supplementary Report from the same.

The committee on philosophical apparatus beg leave to make the further report, that among the articles coming within their province, was one not placed at the exhibition until after their first report. The article referred to is a balance of the most delicate kind used by apothecaries, made by J. Marshall, (*h. m.*) of this city. The nicety of performance of this instrument, and the thorough neatness of its parts, render it highly worthy of notice. It has, when loaded with an ounce avoirdupois, proved, in the hands of the committee, to be sensible to less than the one-fiftieth part of a grain. The beam of this balance is eight inches in length, and of brass, the suspension knife-edge playing upon a concave curve of steel: the suspension of the scale hooks also knife-edge, the hooks being of steel. The scale chains, and uniting hooks, are of silver. The index is above the axis of the beam, and the adjustment made visible by the coincidence of the point of the index with a brass stem fixed above it. The stand of the balance is brass.

In recommending this instrument to notice, the committee would suggest the propriety of offering such encouragement to the manufacturers of balances of this sort, as well as of the more delicate kind for philosophical purposes, at a future exhibition. as shall tend to cherish this useful branch of manufacture.

Hartman Bache,
A. D. Bache.

Philadelphia, October 11, 1831.

Extract from the Report of the Judges on Stoves and Grates.

The committee of judges upon stoves and grates beg leave respectfully to report, that they have paid great attention to the important and interesting duty assigned to them, having witnessed the daily trial of such of the coal stoves adapted to culinary purposes, as the makers or depositors were desirous of exhibiting in actual operation.

Nos. 13 and 14. Two sheet iron cooking stoves, made by Mr. Estlin, were found to bake well; they require a small quantity of fuel, and are well adapted to warming the apartment, but are not considered durable, or convenient for boiling or washing.

No. 206. A sheet iron cooking stove deposited by Mr. Lange, is considered excellent, for baking cakes and pastry.

No. 383. A cooking stove, made by Mr. Steinhauer, is considered very economical, and is much liked by a number of families who have used it.

No. 463. A small cooking stove, deposited by Messrs. Steinhauer & Kisterbock, is considered the most economical and convenient apparatus hitherto presented to the public at a low price, and one by which the poor may take advantage of the safety and economy of using anthracite, heretofore almost exclusively confined to the rich. This apparatus costs about six dollars, it bakes and boils well, is convenient for washing and ironing clothes, and is well adapted to warming the apartment. One ton of fine coal, costing three dollars, will supply it with fuel for four months, using it fourteen hours each day. The committee respectfully recommend that a silver medal be awarded to the inventors for the above apparatus.*

No. 19. A cooking stove made by Mr. J. J. Hess, deserves great commendation for the compactness and number of its culinary fixtures. The oven baked well, but very slowly, and the quantity of fuel consumed appeared to be too large. The boiler for washing is too small for ordinary families.

No. 205. A cast iron cooking stove made by Mr. A. A. Young, is very neat and compact, and will be durable, but it is objectionable from the arrangement of the grate, allowing, (without considerable care,) the products of combustion to enter the room. This stove has two ovens, and the ordinary kettles of a family are intended to be used upon it for boiling, &c.

No. 534, *P.* A cast iron cooking stove, made by Mr. Stackhouse, is very neat and compact, and will be very durable. It bakes and boils well, and the whole arrangement is good. The fixtures are well made, and consist of a large tin boiler for washing, a tin boiler and steamer for meat and vegetables, and a tin tea kettle, to all of which *copper* tubes are attached, which pass through orifices made in the sides and back of the stove, over the fire, and from which an abundance of heat is communicated to the contents of the several vessels. Under the grate is a convenient permanent sifter, to separate the ashes from the coal. The stove, now exhibited, weighs 2 cwt. 2 qrs. 8 lbs; the price twelve dollars, and with the fixtures eighteen dollars; but Mr. Stackhouse has offered to furnish them weighing 1 cwt. 2 qrs. 0 lbs. with the fixtures as above for fifteen dollars, and the committee being informed that the latter will be as heavy, and consequently as durable, as the cast iron stoves ordinarily used, they are of opinion that this stove combines greater advantages than any other now in use, and although the price is not "under fifteen dollars," yet they respectfully recommend that the premium of one hundred dollars, and a silver medal, be awarded to Mr. Stackhouse for the same.*

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* The committee on premiums and exhibitions, after maturely considering this subject, determined to recommend to the Board of Managers in no manner to sanction any stove or grate, in which the fumes of the fuel should come into contact with the victuals intended to be cooked; their recommendation was adopted by the Board. This explanation is given in order to account for the withholding of the silver medal, and with a view to prevent the inference from being drawn, that the Managers had changed their views on this subject; as at present advised they think it proper to adhere to their former decision, in no manner to lend their sanction to stoves or grates constructed on that plan.

The committee remark generally, that all the grates of stoves should be adapted to the burning of *small* coal.

The soap stone grates made by Mr. Bingham and Mr. Peck, are considered very neat.

No improvement is visible in the coal grates, since the last exhibition.

MARCUS BULL,
MOSES KEMPTON,
JOHN U. FRALEY,
JNO. MINGLE.

Philadelphia, October 10, 1831.

Extracts from the Report of the Judges on Carpets.

The committee on carpeting beg leave to say, that they consider the Brussels carpeting, No. 21, (*P.*) manufactured at Carlisle, by Mr. Givan, entitled to the premium, being a handsome and durable article, and entirely of *American manufacture and materials.*

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* Mr. Stackhouse says—

I engage to furnish, if ordered, fifty coal stoves, weight 2 cwt. 0 qrs. 8 lbs., of the kind exhibited at the late exhibition of the Franklin Institute, without kettles for - - - - - - - -	$12 00
And one kettle with a copper tube, and boiler and steamer, -	3 00
One wash boiler with copper tube, - - -	2 50
	$17 50
Allow me to reduce the weight (48 lbs.) of stove to 1 cwt. 2 qrs. 0 lbs., deduct - - - - - -	2 50
	$15 00
Allow me to substitute iron boilers of the same capacity with any of the others exhibited, and the price will be reduced to -	$14 50

The ingrain, No. 20, manufactured at Carlisle by Mr. Givan, and that manufactured by the Lowell Company, No. 5, (*P.*) we would leave to your decision, remarking that we consider the Lowell of *superior manufacture*, though not exclusively American, (the warp having been imported in the grease,) and we should not hesitate to recommend it for the premium, if it had been entirely American. The Carlisle is entirely American, and of an excellent quality.

The Brussels, No. 6, manufactured by the Lowell Company, we consider a splendid article, the colours and manufacture being equal to English, and we should have considered it entitled to the premium, if it had been exclusively of American materials.

(*H. m.*) We take pleasure in recommending to your notice the beautiful piece of *painted floor cloth*, manufactured by Mr. Isaac Macauley, of this city, which we think equal in durability and beauty to the English. The oil cloths for table covers, also manufactured by Mr. Macauley, we consider superior to any imported of the same kind of goods.

(*H. m.*) Wm. Christie and Lloyd Mifflin would also recommend to your notice, the tufted hearth rugs, No. 37, manufactured by Doggett, Farnsworth & Co. which they consider much superior to any of the same kind they have ever seen of American manufacture, both for durability and workmanship.

Wm. Christie,
L. Mifflin,
Jacob Farnsworth, } *Committee on Carpetings.*

October 7, 1831.

Explosions of Steam Boilers.

Continued from p. 30.

(No. XXII.)

WITH A COPPERPLATE.

To the Committee on the Explosions of the Boilers of Steam Engines.

Gentlemen,—Believing that the greater number of explosions which take place in the boilers of steam engines, are occasioned by suffering the water to get too low in them, thereby leaving the sides and flue exposed to the action of the fire, and heating them and the steam to an unwarrantable degree, I take the liberty, (without assigning any philosophical reasons,) to offer the following arrangements for your consideration.

1st, To regulate the quantity or height of water in the boilers at all times, whether the engine is in motion or not.

2nd. To regulate the pressure of steam in the boiler, or to prevent a greater increase of power than is required.

3d. To detect the incorrectness of the safety valve, and the negligence of the engineer; also to give notice should any thing be wrong in the boilers.

4th. To indicate the temperature or relative heat in the boiler.

5th. To enable the engineer to clean the boilers, in a great degree, at any time, without the necessity of stopping the engine.

6th. To prevent the water from flowing from that boiler which becomes the highest, in consequence of the boat being careened, or out of level.

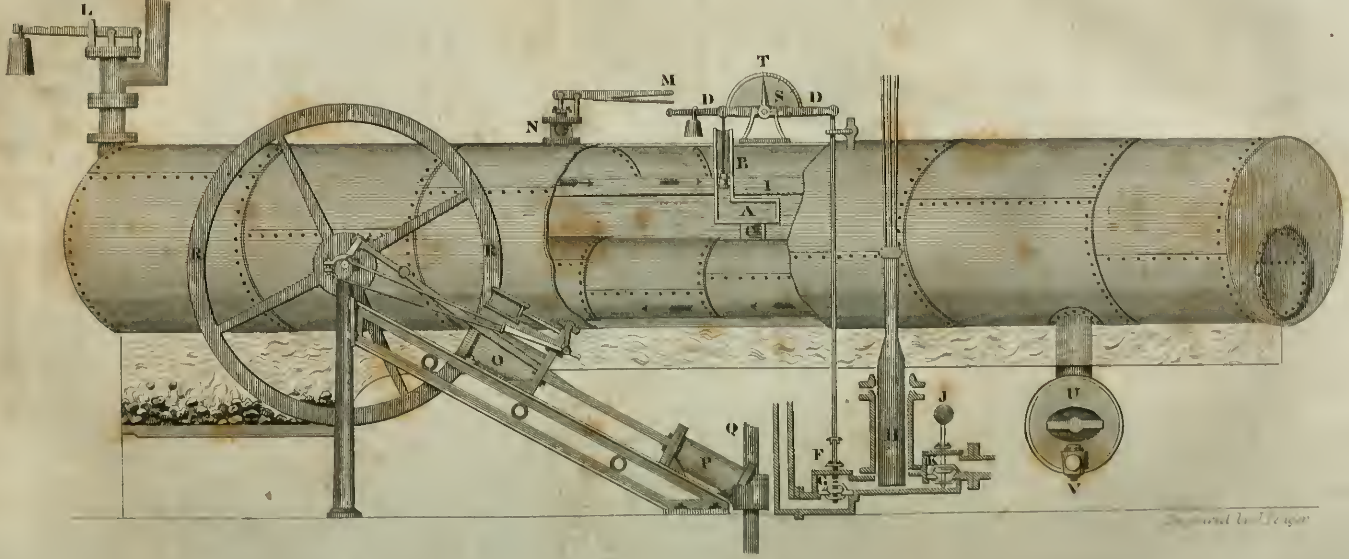
7th. To scrape or remove obstructions in the supply pipes, while the engine is at work.

Description of the Plate.

1st. To regulate the quantity of water.—A, is a small reservoir containing mercury. B, is a small cylinder attached to A, in which is a piston. C, is a part of the flue E, so arranged as to admit the fire to act on the bottom of A; the operation then will be that as the water settles, the top of A becomes uncovered by water, consequently the heat is not carried off so fast, and the expanding mercury forces up the piston and gives motion to lever D; which, by its connexions, as shown by the drawing, raises the stop stem F, which allows the valve G to rise, and admits the water into the forcing pump H; the motions are reversed when the water arrives at the proper height, as shown by the line I; by covering A, the temperature of the mercury is reduced, so that the piston descends, which causes the stop stem F, to approach nearer to the valve G, so as to prevent the valve from rising higher than necessary to admit a regular supply of water. J, is a weight placed on the stem of the valve K, so that the engineer can at all times tell when the pump is in working order, by the motion of the weight up and down, for should any thing be the matter with the pump, the weight will be stationary.

2nd. To regulate the pressure of steam, &c.—L is the common safety valve loaded to the pressure desired; the steam being at that height, the mercury is poured into the reservoir A, until it rises to the proper height, as, for instance, to about the position in which the piston is placed in the drawing; the operation then will be, should the safety valve be overloaded by carelessness, designedly, or accidentally prevented from working, the mercury will rise by the increasing heat of the increased pressure of steam, as well as if the water had been below the top of reservoir A. By the raising of the piston, the end of the lever D is made to press against the spring attached to the lever M, until it bears hard against the end of M, when the valve in N will open quickly and wide, and let the steam on to the small engine O, which is made to work the cold water pump P, to force the water into the boiler through the pipe Q; the cold water reduces the temperature of the water and steam in the boiler, until they come down to the pressure required, when the small engine will stop. To insure the starting of the engine without the assistance of the engineer, it will be necessary to load the fly wheel R, so that the crank will always stop in a proper position for starting. It would be probably better to have two small cylinders, with the cranks placed at right angles, there would then be no doubt that the engine would start as soon as the valve N were opened. From the foregoing explanation, you will perceive that the small engine will

Journ: Frankn. Institute Vol. IX. Plate 2.



Engraved by J. Yeager

keep the water to the proper height when the boat is stopped; the cylinder B, is intended to give notice should any thing be wrong in the boiler, whether the steam be too high, or the water too low.

3d. To indicate the temperature in the boiler, the brass plate S is graduated so that, by the position of the index T, you can see the relative heat in the boiler.

4th. To enable the engineer to clean the boilers and fill them.—It is well known that where there are heaters attached to the bottom of boilers, that all the dirt and sediment collects in them. It is also well known that those heaters burn out first, owing to the sediment being collected in them and acting as a nonconductor of heat. I therefore propose placing a cross receiver for dirt and sediment connected with the boilers, as shown by the drawing, at U, so that the fire will not act on it; there will be little or no heat lost, as it will not descend. The reason why the sediment collects in those receivers, I conceive to be owing to a continual current in the water from the fire end to the back end of the boiler, and more particularly when the supply is going on; the water at the fire end being lighter, in consequence of the greater heat, rises to allow the heavier or colder water coming from the back end of the boiler, producing a current, as represented by ⟹ in the drawing, allowing the dirt, &c. to pass down the pipe connecting the boiler and receiver; there should not be more than two boilers connected to a receiver when placed in a boat, otherwise we would have no advantage in placing the supply pipes as shown in Fig 2. V, is a cock placed in the end of receiver U, by opening which the dirt, &c. will be forced through a pipe, leading to the outside of the boat under water, which can be done as frequently as you wish. Should you wish to empty your boilers entirely and refill them, the engineer will first put out the fire, leave the doors open to cool down the furnace; then, before the steam gets down, open the cock V, and let all the water out; then by forcing a small quantity of cold water into the boiler, the steam beginning to condense, the water will rush back through the pipes and fill the boilers as high as necessary, when the cock should be shut.

Fig 2.

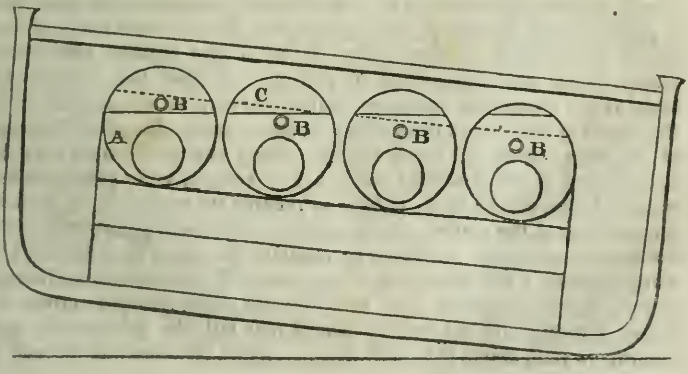


Fig. 2. To prevent the water from flowing from the higher boilers to the lower ones. A, the end view of the boilers. B, the ends of the supply pipes, placed within three inches of the surface of the water, as represented by the dotted line C, which is the position when the boilers are level. The black lines show the position of the water as relates to the boiler when the boat is careened. You will perceive that it is impossible for the water to flow below the bottom of B, let the boat be ever so much careened, or out of level. The drawing shows the pipes without valves on the ends, which would be necessary to prevent any water from flowing back; they should have hinge valves such as represented in the margin. To clean the supply pipes they should be arranged as represented in Fig. 3.

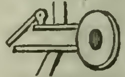
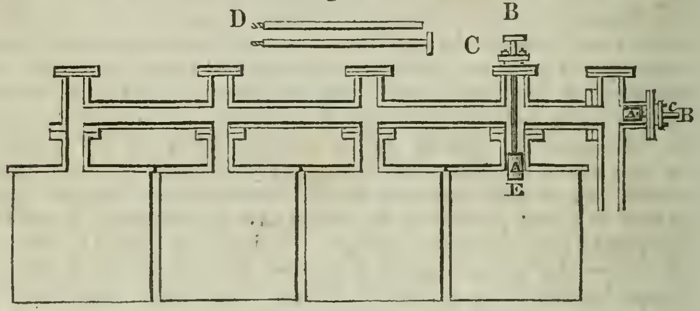


Fig. 3.



A, is a small cylinder made of sheet iron, about a quarter of an inch thick, with the ends somewhat sharpened, fastened to the stem B, working through a stuffing box, as at C. D, are connexions for screwing on the end of B. A, being forced backwards and forwards, scrapes the side of the pipe entirely clean. At E is a scraper of the same kind as that placed at the end of each boiler.

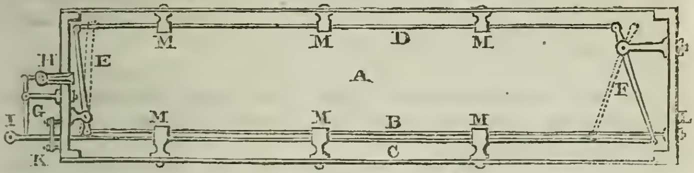
The advantages of making use of the mercurial apparatus are many, because as mercury is a fluid metal expanding by heat with a great power, it can put in motion any fixture necessary to regulate the water; to throw the water of the regular cold water pump direct into the boiler; to give notice when the steam is too high, at the same time acting as a safety valve, also to warn you when the water is too low in the boiler; to open doors placed at the ends of the flues; start the small engine; direct the cold water into the fire, &c. all of which can be done at their respective or proper times, merely by arranging each fixture to receive its motion at a particular position of the piston; as, for instance, in the regular state of the boilers, its operation is solely to regulate the valve G. Should any thing prevent a full operation of the pump H, the piston continuing to rise by the increasing heat, sets the cold water pump to throw the water directly into the boiler; should that fail, the piston still continuing to rise, starts the small engine, opens the doors at the end of the flues, opens the cock to give notice, and changes the direction of the water to put out the fire.

Yours, respectfully,
CADWALLADER EVANS.

Further observations for the consideration of the Members composing the Committee on the explosion of steam engine boilers, of the Franklin Institute.

Fig. 1. Expanding rods to prevent the explosion of steam boilers.
A, a ground view of a steam engine boiler. B, C, D, are brass rods of about three-fourths of an inch in diameter. E and F are levers connected to the brass rods. G, a lever attached to the valve cock H. K, a stuffing box at the end of the boiler. M, M, are guides to prevent the rods from bending.

Fig. 1.



Explanation of the principle and operation of the rods.

Smeaton, in his experiments on the expansion of metals, has found that 180 degrees of heat, will expand iron one foot in length $\frac{151}{10000}$ of an inch, and that brass expands $\frac{232}{10000}$ of an inch. Suppose the boiler to have been 20 feet in length, and the rods 18 feet: we will now suppose that rod B is secured to the back end of the boiler at L, then 232, expansion of one foot of brass, × 18 = 4176 — 151 × 20 feet length of boiler = 3020 = 1156. Expansion of rod B beyond that of the boiler, which × 13, the ratio of length of the arms of lever E, = 15028 + 4176 = 19204 the motion of the end of rod D, which × by 12, the ratio in length of the arms of lever F, = 230448 + 4176. Expansion of rod C, = 234624, the motion of the end of rod C at 1, which ÷ by 10,000 = $23\frac{4624}{10000}$ inches. Now, as 180 degrees : 23.4624 : : 10 degrees = $1\frac{3034}{10000}$ inches, so that it appears a very small increase of temperature will give the necessary motion to open the cock H, at the proper time, it can also be applied to regulate the damper, to increase the supply of water, or to direct the water of the cold water pump immediately into the boiler; it is also evident that we are not limited in the motion of the end of the rod C, but can arrange the machine so that one degree will give a motion of three or more inches: when the boilers are made of copper, the rods should be of iron, the motion of the rods would then be reversed by increased heat.

Fig. 2.

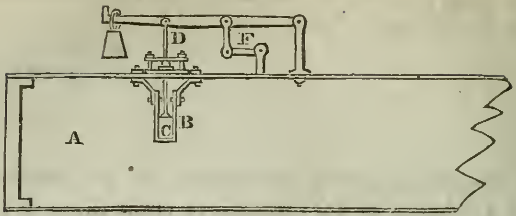


Fig. 2, represents an improved application of the fusible metal for the purpose of giving the alarm when the water gets too low in the boiler. A, the boiler. B, a small cylindrical tube. C, the fusible metal. D, a stem passing through a stuffing box, and resting on the fusible metal, the other end fastened to lever E. F, an alarm cock which opens when the rod D descends in the fluid metal, and gives notice that the water is too low. What I consider to be an improvement is the use of the cylinder, which prevents the metal from being lost, and is always ready for a new operation. I believe in all other applications of the fusible metal, it would be necessary to get the steam down, and, in some cases, to empty the boiler before the metal could be applied for another operation.

Cadwallader Evans.

The above drawings are not made to any scale, nor have I shown the application of the rods to all the purposes intended, as I have not time to do this at present.

(No. XXIII.)

Letter from John G. Cassedy, dated

Washington City, October 4th, 1830.

Gentlemen,—Aware of the magnitude of the subject upon which I intend addressing you, involving the lives and property of the citizens of our country, I will treat the subject as fully as circumstances will allow, paying due regard to that brevity so desirable in communications of this nature.

The repeated and melancholy catastrophes arising from the explosion of steam boilers, have produced in our country a general, and I hope, a beneficial, excitement, causing minute researches and investigations that may ultimately avert such awful and terrible consequences. A moment's reflection upon the recent explosions of the Helen M'Gregor, Chief Justice Marshall, and others, would, were conviction necessary, convince the most obdurate that immediate and prompt measures should be taken to prevent in future such vast sacrifices of life and property, to whatever causes they may be attributable; whether from defects in boilers, ignorance, negligence, or other causes yet unknown, the proper and efficient remedy for which, I humbly pray, may be the result of your philanthropic investigations; which, if aided by the zealous co-operation of Congress, I have not a doubt will be the case, and that in future our lives and property will be secured from such disasters.

The circular published by you, requesting information upon this important subject received my early attention; but circumstances have, until now, prevented me from addressing you on this subject, and when it is receiving the consideration of the science and experience embraced in the Franklin Institute of Philadelphia, perhaps delicacy ought still to restrain me.

That part of the extensive subject to which I would draw your attention is the construction of the safety valve, it being in its present form, as generally used in this country, considered, and found by experience, highly defective. Against the safety valve now in use there may be urged the following objections, which the improvements I have to propose will entirely obviate.

It admits of being loaded to any extent, thereby increasing the density of the steam to any indefinite pressure, without the slightest knowledge being given to, or attainable by, any of the passengers who might take the necessary precautions for their safety. It is sometimes so placed that it can be loaded by any unguarded hand, or passenger, on board the boat; and, lastly, it is at the entire command of the engineer, offering every facility to increase the pressure when ambition or other causes might induce him to hazard the lives of the passengers for the paltry consideration of excelling in speed. I will proceed to examine these objections, stating the manner in which they can be obviated. A boiler, constructed to work upon the high or low pressure system, is regulated in its strength accordingly; each thickness of iron having a corresponding pressure to withstand, which, for a limited time, can be borne with safety. Boilers, when originally constructed, have their pressure regulated by the weight affixed to the safety valve, which, when retained in its original position, produces no more than an ordinary density of steam; though in its construction, (the weight being hung to a horizontal lever, with its fulcrum at the extreme end,) the weight admitting of being removed to the other extreme end, or from the fulcrum; thereby increasing the effect of the weight upon the valve in proportion to the leverage obtained. To exemplify this objection, I will relate an anecdote of a steam-boat captain, in the western waters. A boat had overtaken him; the steam was raised to "blowing off;" he jumped upon the safety valve, and swore he would either "beat her, or else blow up." To men so destitute of the principles of prudence, the life of an unwary passenger should never be intrusted, I therefore would place this safety valve beyond the reach of one so hazardous and imprudent. Any hand, or passenger, on board the boat, unconscious of the dangers that arise, might remove the weight from its proper position to the extreme end of the lever, thereby increasing the pressure perhaps two fold; from any such dangerous removal serious consequences must ensue.

In a momentary excitement, similar to the above instance, the captain, or engineer of the boat, might remove the weight on the lever, regardless at that time of attending dangers; while in an hour of cool deliberation he might shudder at the dangers he had escaped, and wonder at his extreme good fortune.

To obviate these general objections, arising from the dangerous alterations to which this valve is susceptible, I will explain the construction of the valves possessing these qualities. For boilers working upon the low pressure system, where steam much above one atmosphere is impracticable, I would have a chamber, A, A, Fig. 1, having at the bottom a seat for the reception of the valve B, (as constructed upon the ordinary principle;) the requisite load or weight *c*, should be cast upon this valve, fitting close into the chamber A, A, with an intermediate space only sufficient for the action of the valve; there being grooves cast upwards in the load *c*, as channels for the steam to escape when the valve is raised; when from the filling of the chamber with the weight or load *c* it is impossible to increase the weight within the chamber A, A. To prevent any weight being hung to the vertical valve rod, (as done on some occasions,) we would dispense with this rod, and substitute a chain, D, which chain, while answering all the purposes of a rod in raising the valve, will allow no additional application of weight, for a chain bearing a strain equal to its strength, will not withstand the least pressure without coiling; as would be the case with the chain D, in an attempt to load by the outward lever. The weight *c* is hollow, the chain D, being attached to the top of the valve. By this simple contrivance of enclosing the weight immediately upon the safety valve in a close chamber, and of having it raised by a chain, coiling the moment any pressure is applied, all stratagems of an imprudent and hazardous engineer are put at defiance; or when through ignorance he may be unconscious of the dangers he is hazarding by an increase of pressure on the valve: as thus contrived it is utterly impossible.

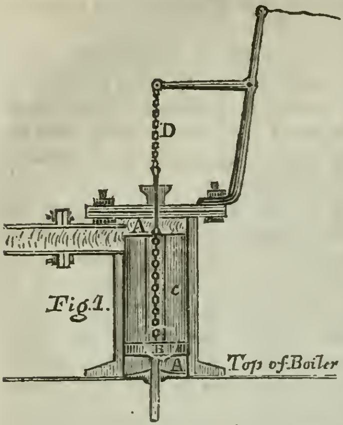


Fig. 1.

Another construction of the safety valve, similar in its principles and advantages, is, like Fig. 1, adapted principally to low pressure boilers.

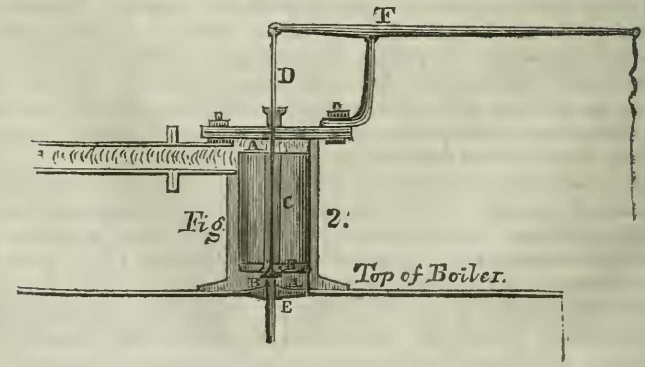
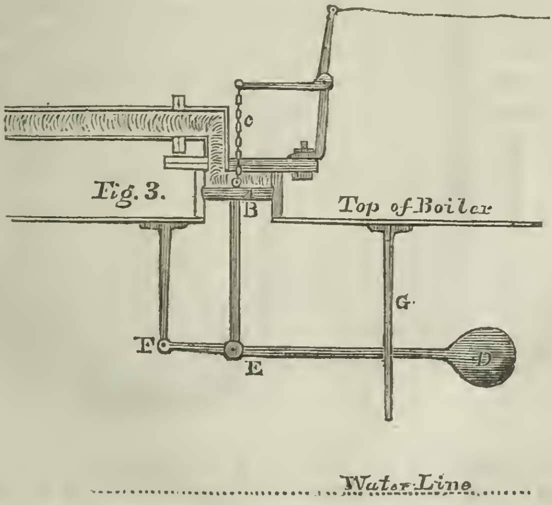


Fig. 2.

The valve B, Fig. 2, is loaded like Fig. 1, with a small hole drilled vertically through the weight C and the valve B, with a valve seat at the bottom for the reception of the small valve E, into which it works, closing upwards. When an attempt to load is made by suspending a weight to either end of the lever F, both applications are found to allow the steam to escape; for by hanging it to the short arm you depress the valve E, it opens, and the steam escapes; or if hung to the long arm, it raises the small valve, which closes and presses upwards against the large valve B, which lightens or even raises it, allowing the steam to escape. The small valve opens downwards, the large valve upwards.

From the greater weight required upon the safety valve of a high pressure boiler, it would be impracticable to load the valve upon this principle, having to extend the chamber to a considerable height or width. To prevent this, the chamber should be perfectly close, as heretofore, leaving no space for an addition of weight, with the guide extended to some convenient length downwards, as in Fig. 3, with a joint below to be attached to the lever E, having its fulcrum at the extreme end, F, with a lead weight, D, cast upon the other extreme end of the lever E. By this leverage of the weight, (supposing it to be quadruple,) the effect of the weight upon the valve will be quadrupled, one hundred pounds acting with a pressure of four hundred pounds in virtue of the leverage obtained.

To prevent the lever E, and weight D, from receiving a swagging motion from that of the boat, it can be admitted into a groove staunˆcheon, G, secured to the top of the boiler, extending downwards; this groove of a length only to allow a sufficient rise of the valve A for "blowing off."

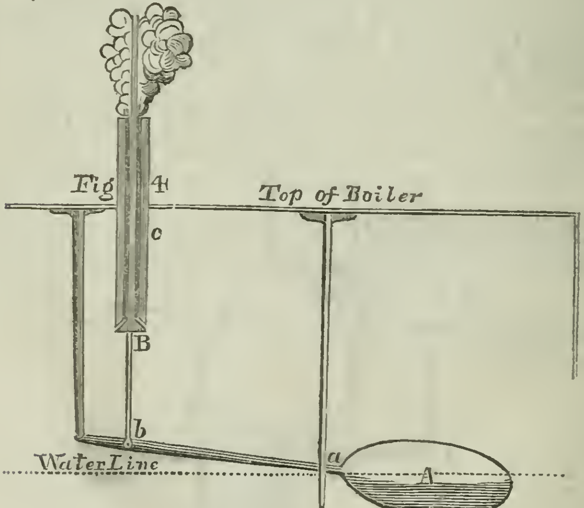


This construction of a safety valve, (intended for high pressures,) though not presenting a total impossibility of an increase of weight, still presents difficulties which are not easily overcome; nor could the slightest addition be made to the weight, for one or two days, required for the boiler to cool before any person could venture in it to make the alteration, which trouble and delay it is supposed few will take when engaged in regular trips with passengers or freight, thus preventing entirely any sudden increase of weight which a momentary excitement might prompt the captain or engineer of a boat to make, and which upon mature deliberation would be censurable even in themselves.

Scarcity of water in the boilers of a steam engine, causing in a great measure the most awful and fatal explosions, of late rendering a passage in a steamer a voyage of fear and apprehension, may be well attributed to the inattention of some of our engineers to a most necessary part of their duty, namely, that of keeping a proper supply of water in their boiler.

Every boiler is supplied with two or more gauge cocks, for the purpose of ascertaining the height of water within it. With sufficient attention paid to these, other contrivances would be superfluous; but experience in many instances has taught that other contrivances are necessary, compelling an engineer to pay sufficient attention to his gauge cocks. A plan of one I will endeavour to explain. (See Fig. 4.)

Fig 4



It is the application of a float, A. to the working of a valve, B, fitted and ground into the bottom of the pipe C, secured to the boiler; the valve having a guide extending through the pipe, with the other necessary levers for its operation. When the water is at its proper height, the buoyancy of the float A, will close, and keep closed, the valve B, which is perfectly steam tight, but in the event of the water lowering to a dangerous point, the float A, by its own gravity, will descend with it, acting with the leverage *a*, *b*, brings with it, and opens the valve B, thereby allowing the steam to escape through the pipe *c*. The lever of the float A is steadied by a grooved stauncheon, as described in Fig. 3.

A negligent engineer will thus receive an effective warning of his danger, demanding immediate and prompt attendance to a renewal of the requisite quantity of water, as the only means to prevent the steam from escaping.

These contrivances, if generally adopted, might afford security against a dangerous pressure of steam; if obtained by these or any other contrivances that your experience and science may recommend, I will receive sufficient remuneration for my trouble.

Gentlemen—Before quitting this subject, which has been so deeply impressed upon you and the majority of our citizens, allow me to pay a passing tribute of respect and gratitude, due from our country to your indefatigable zeal and labours in so humane a cause: the deep interest you have taken in this momentous subject, and the ability with which such a scientific investigation must be continued by you, will no doubt prove successful in preventing further sacrifices of our fellow citizens. For your unremitting exertions for the attainment of these desirable ends, you will call forth the thanks of our travellers, our citizens, and our country, whose safety and welfare you have made your study, and whose gratitude, which you merit, shall be continued as long as the beneficial results of your labours shall be experienced and admired.

Allow me, gentlemen, to conclude by offering an apology for this humble tribute which love of country has induced me to offer; should you think it worthy of perusal, my gratitude will be increasing and continual, while the suggestions of the humble may be thought worthy of consideration.

I have the honour to be,
Gentlemen,
Your obedient servant,
John G. Cassedy.

In writing this communication upon the safety valve, two of my own construction only were included, when by request of a gentleman of science, I included two of his, to whom the merit of the original idea belongs, he having called upon me to furnish drawings, &c. by which circumstance my attention was first drawn to the subject.

(No. XXIV.)

Extract of a letter from James D. Woodside, dated

Washington City, *August* 22, 1830.

Sir,—By an advertisement in a paper of this city, I perceive that it is the wish of the Franklin Institute to receive from individuals their ideas in relation to the bursting of boilers on board of steamboats, and if practicable to devise some plan to prevent it. I therefore do myself the pleasure to remark, that, in my opinion, though the causes of explosions are many, yet there are two which may be considered as the principal ones.

The first I shall name is defect in the metal, and the second permitting the water to get too low in the boiler. The water in the boiler should never be permitted to fall below a certain line. About three years since I devised a plan for preventing boilers from bursting, by having a safety valve within the boiler, where no one can possibly meddle with it, and so constructed as to open itself when the water has fallen to a certain depth. This valve will certainly open of itself when the water has fallen below it.

There might be a great improvement made in boilers which would very materially strengthen their ends, viz. by having them convex within, and, of course, concave without. Added to this, let bars of wrought iron be placed across the ends of the boiler, say three bars making ends to overlap the edge and support the rivets all round.

In the present mode, safety valves are placed where additional weights may be applied to keep them closed; this in a race has been the cause no doubt of many disasters. I remember to have noticed a paragraph in a Baltimore paper giving an account of the explosion of a boiler, caused by the captain's adding his weight to the lever for closing the valve, which caused the boiler to burst, and did considerable injury.

* * * * * *

Very respectfully yours,
James D. Woodside.

(No. XXV.)

Letter from E. Bigelow, dated

Washington City, *September* 23, 1830.

Sir,—I believe that I have found a means by which explosions may be prevented. Though there may be many causes of these accidents, I believe a deficiency of water in the boiler to be the principal one. I propose to place a pipe upon each boiler, under which is a plate of iron or copper much weaker than the boiler; this plate will give way sooner than any other part of the boiler and allow the steam and water to blow up without damage.

Yours, respectfully,
E. Bigelow.

(No. XXVI.)

Second letter from E. Bigelow, dated

Washington City, September 25, 1830.

Sir,—My first letter not having referred to a method of preventing a collapse of flues within boilers, I write again to propose that moveable braces should be placed within these flues. Such braces should not be made so large as to interfere with the draft, or with facility of removal.

Yours, respectfully,
E. Bigelow.

(No. XXVII.)

Extract of a letter from John D. Weird, of Vergennes, Vermont.

I see that there is much discussion upon the subject of the bursting of steam boilers, and that your Institute is investigating the matter, and as all sorts of opinions appear to be requested, I beg leave to offer mine as the result of no inconsiderable practical experience, although I know it differs from the opinions of nearly all the steam engine builders on this side of the Atlantic, and also from an opinion published by Dr. Jones in your journal, that steam of the elastic force of fourteen or fifteen pounds per square inch may be used with safety. My opinion is, that steam of greater force than three or four pounds per square inch above the pressure of the atmosphere can never be used without great danger, for no ingenuity can render a boiler secure against accidents, therefore security can only be obtained by using steam of such force as shall not produce extensive mischief when accidents do happen. Mr. Burr says,* "we hear of no similar explosions in Great Britain;" the reason is, that all the British "marine engines," as they are called there, are worked with a pressure of only three or four pounds per inch in the boilers, instead of the thirty-six pounds per inch used in many of the American low pressure boats. And it is a fact too that some steam engines, made by Mr. Watt forty years ago, will at this time perform more work, with a given quantity of fuel, than any that have been made since, and they are uniformly worked with the low pressure of four pounds per inch. This circumstance is certainly no argument in favour of using high steam for the sake of economy.

I am, &c.
John D. Weird.

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* Jour. Franklin Institute, p. 333, vol. vi.

Franklin Institute Quarterly Meeting.

The thirty-second quarterly, or eighth annual meeting of the Institute, was held at their hall on Thursday, January 19, 1832.

Thomas Fletcher, Vice President, took the chair, and William Hamilton was appointed secretary, *P. T.*

The minutes of the last quarterly meeting, and also the minutes of the meeting held this day at 4 o'clock, to appoint the tellers, and to open the poll for the election of the officers and managers of the Institute for the ensuing year, were read and approved.

The annual report of the Board of Managers was read and accepted, when, on motion, it was referred to the committee on publications, with instructions to publish it.

The annual report of the Treasurer was read and approved.

The amendment of the constitution, proposed at the last quarterly meeting, was called up, when the following amendment was offered, viz.

Article 2nd, section 4th. Any member who shall have refused to pay his annual contribution for two successive years, shall, by a vote of the managers, forfeit his membership; but he shall not thereby be exonerated from the payment of his arrears.

Which, after some discussion, was unanimously adopted.

The tellers appointed to receive the votes of the members, made their report, when the Vice President declared the following gentlemen duly elected Officers and Managers for the ensuing year.

President..............James Ronaldson.

Vice Presidents........Isaiah Lukens,
Thomas Fletcher.

Recording Sec.........J. Henry Bulkley.

Corresponding Sec.....Isaac Hays, M. D.

Treasurer..............Frederick Fraley.

Managers.

1. Samuel V. Merrick,
2. Abrm. Miller,
3. Wm. H. Keating,
4. Adam Ramage,
5. Isaac B. Garrigues,
6. Rufus Tyler,
7. John Struthers,
8. John O'Neill,
9. M. W. Baldwin,
10. Saml. J. Robbins,
11. Mordecai D. Lewis,
12. Chas. H. White,
13. Thos. Scattergood,
14. Benj. Reeves,
15. Alexr. D. Bache,
16. Alexr. Ferguson,
17. Joshua G. Harker,
18. John Agnew,
19. Charles Toppan,
20. Geo. W. Tryon,
21. John Wiegand,
22. William Wetherell,
23. John B. Trevor,
24. William B. Reed.

The committee on statistics reported that they had prosecuted their preparatory duties almost to completion; the circulars and schedules were all ready for distribution.

On motion, the committee on statistics were instructed to present at the next monthly meeting a list of persons to be nominated to serve as ward committees to collect the information relative to the manufacturing establishments, &c. in the city and districts of Philadelphia.

Thos. Fletcher, *Vice President.*

William Hamilton, *Rec. Sec. P. T.*

Report of the Board of Managers.

To the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, the Board of Managers respectfully submit their Eighth Annual Report.

The termination of the eighth year of our labours invites us to a review of the general concerns of the Institute, and of the progress which has been made during that year to promote the great objects for which it was established.

Pursuing the order which was adopted on former occasions, we shall first call the attention of the members to that part of our duties which is connected with education.

This was the first object of the founders of the Institute, and must ever continue to be one of its most important departments. Another year's experience adds to the high opinion previously formed of the general fitness of the plan of instruction heretofore pursued, while the success of some new and hitherto untried projects seems to invite to further experiments in order to add to its usefulness and efficiency. The separation of the subject of practical mechanics from the chair of natural philosophy and mechanics has added to the attractions of our lecture room. The instruction delivered every fortnight by our new lecturer, Mr. Franklin Peale, has from its novelty and from the intrinsic merits of the lecturer, attracted much attention on the part of the public; the experiment, so far as it has proceeded, has given to the Board great satisfaction, and has, it is hoped, been equally gratifying to the members of the Institute at large. By reducing the very extensive field which had fallen to the lot of Professor Johnson, it will relieve him from part of his duties, and enable him to devote more time to other portions of the important professorship committed to him. Natural philosophy may be considered as the very element of all the subjects taught in the Institute's lecture room. Without a proper knowledge of it, the students will derive much less benefit from the lectures on mechanics, or on chemistry. It is therefore desirable that this science should be taught as thoroughly as possible, and that the lecturer's attention and time be not divided between too many subjects. The course of chemistry, by Prof. Franklin Bache, continues to enlist the attention of a large and respectable part of the community.

It is with much pleasure that the Board advert to the increasing interest in our lectures manifested by the females and younger branches of the families of our members. There have been issued by the actuary, 196 minors' tickets, 63 ladies' tickets, and two strangers' tickets. Including female minors, there are now 110 ladies attending our lectures, which is an increase of 44 over our number last year.

Our schools have also experienced some change in their organization, and have, we believe, increased in efficiency. The drawing school retains its usefulness, and includes at present thirty-nine pupils. The teacher of ornamental drawing, Mr. Bridport, having resigned his situation, it has been found expedient not to fill the vacancy during the present winter. The teacher of architectural drawing, Mr. Strickland, is well qualified to give instruction in all the departments, and experience has satisfied us of the propriety of having but one teacher in the same room at the same time. Doubtless, if the funds of the Institute permitted us to retain for our own use some of the apartments which are now rented, a more enlarged plan of schools could be adopted, consistently with the ampler accommodations which would then be at our disposal. Foremost among the departments which would claim a portion of these accommodations, would be the new English school lately opened by the Board. Our predecessors have had frequent opportunities of expressing their sense of the importance of the mathematical school, established soon after the formation of the Institute, and their regret that it did not meet with that encouragement to which it seemed entitled. Believing that its failure proceeded from the circumstance that its plan was too restricted, and not sufficiently popular, the Board have this year established an evening English school; in which all the branches of a plain English education are taught; with this additional circumstance, however, that the high qualifications of the teacher will enable him to carry his pupils as deeply into the science of mathematics as it may be convenient or desirable that any of them should proceed. This school embraces, therefore, all that was expected of the mathematical school, while its more enlarged field of operations will, we hope, give it an additional degree of popularity with the members of our association. The salutary provisions of our laws, as well as the more powerful influence of public opinion, require that each apprentice shall receive from his master, during the term of his apprenticeship, a certain amount of schooling. Unfortunately, however, this part of the indentures is in many cases but imperfectly attended to. It is the object of the Board to establish a school of such a character as shall command the good opinion of our members, and induce that large portion of those who are engaged in mechanical pursuits to select it as the best for the education of their sons, and of the apprentices committed to their charge. To the journeyman, likewise, who wishes to improve himself, it will offer great inducements. Actuated by these views, the Board have selected for the teacher Mr. Seth Smith, and have placed the expenses of the school upon the lowest terms. The committee of instruction have reported to the Board the entire satisfaction which they experienced from the judicious mode of instruction adopted by Mr. Smith, from the good order and attention which prevail in the school, and from the accommodations which it affords to those who now attend it. It has been open but a few weeks, and the number of pupils in attendance is consequently very limited, but there is reason to hope, that after it shall have been longer in operation, and have become more generally known, it will receive additional patronage, and by its increased numbers, as well as by its merits, reflect credit upon the Institute. To the fostering care and attention of their successors the Board would specially recommend this school, as an instrument calculated to produce great good.

The Board having ascertained in the beginning of the year, that a gentleman of this city was disposed to give a course of lectures on geology, provided sufficient encouragement were given him, granted to him the use of their room, free of rent, or expense of lighting and heating, on condition that corresponding advantages should be extended by him to such of our members as chose to attend the lectures, and it is believed that a number of them availed themselves of the opportunity.

The following schedule exhibits the benefits derived by the community from our system of lectures and schools; premising, however, that it does not include the number of members of the Institute that attend the lectures, but merely the extra tickets sold, during the last and the present winter.

	1830–1	1831–2
Lecture tickets sold for minors, .	175	196
do. do. ladies, . .	42	63
do. do. strangers, .	2	2
	219	261
Drawing school tickets, architectural department,	41	39
do. do. miscellaneous do.	19	suspended.
English evening school, recently established,		23
Aggregate, ...	279	323

Increase over last year 44.

The next subject to which we would invite your attention, is that of exhibitions. The experience of each succeeding year adds to our conviction that next to education, and second only to that in importance, are the displays of domestic manufactures made at stated periods under the patronage of the Institute. It would carry us too far at present, and indeed it would be a work of supererogation, to enlarge upon the great benefits which the country derives from them; it will suffice to state, that to the Institute itself they are of incalculable advantage—they keep it in close and intimate connexion with the manufacturers and mechanics not only of this city, but of the

Union at large—they quicken the zeal and interest of our fellow citizens in the prosperity of an institution, which, so long as it shall continue to restrict itself to its legitimate field of operation, cannot fail to receive, as it will deserve, extensive patronage—they gratify the just and honourable pride of the mechanic, and induce him properly to estimate the character of the association, which enables him without any expense or trouble to himself, to select in his obscure and remote workshop, the wares which, when exhibited in broad daylight before thousands of his fellow citizens, procure to him the meed of approbation, as well as the more solid benefits resulting from a due appreciation by the consumer of the merits of the manufactures of our own country. To promote these exhibitions, and to secure their success, it is the duty of those whom you have entrusted with the stewardship of your affairs, and who have accepted the trust, to spare no exertions, and to avoid no reasonable expense. Impressed with these views, this Board adopted at their very first meeting the project of holding an exhibition in 1831, and at their first stated meeting, they decided that as no views of mercenary profits influenced the Institute in their establishment, all the proceeds from the sale of tickets of admission, should go to the defraying of the expenses of the exhibition, and that any surplus funds should be appropriated to the improvement of subsequent ones. Accordingly the expenditures of the last exhibition have been upon a more liberal scale than those of any that preceded it. Our Actuary was sent to visit the principal manufacturing towns and establishments in the United States, in order to establish a personal connexion between the proprietors and the Institute. They were invited to send their goods to our exhibitions, the objects and character of which were fully explained to them. Several of them availed themselves of the opportunity of doing so, and others who were not prepared for the exhibition of 1831, have promised to contribute to them in future. The success of that held in October last has fully realized our most sanguine expectations, and is believed to have exceeded in interest any of those which had preceded. It has certainly shown that neither the zeal of our manufacturers, nor the interest of the public, had suffered the least impairment by the frequent repetition of our appeals to them. Influenced by these motives, the Board immediately afterwards considered the propriety of holding the eighth exhibition in October next, and resolved the question affirmatively. Without intending to decide that circumstances may not at some future time require that their recurrence be less frequent, we shall confine ourselves to the statement that hitherto no such necessity has presented itself, and that we are of opinion that it is the duty, as well as the interest of the Institute, however troublesome their exhibitions may be, not to shrink from them so long as they are productive of the benefits which have hitherto attended them. If any further proof be wanted of the estimate in which they are held by the public, we shall find it in the readiness with which the Institute have been intrusted with the appropriation of moneys raised for the advancement of certain branches of industry. The sum of one hundred and twenty dollars was last year placed at their disposal to encourage a competition on stoves and grates for anthracite; of this fund one hundred dollars have already been awarded. A still more flattering proof of confidence was evidenced in the appropriation by the City Councils of the sum of one hundred dollars, to be awarded by the Institute to the successful competitor on street lamps, in October next.

With a view to do justice to all those who had deposited their wares at our last exhibition, a full account of it has been published in pamphlet form, and is in the course of distribution. To it is annexed the plan of the eighth exhibition, with the list of premiums to be then awarded; the Board would earnestly invite the members to assist in its extensive circulation. Finally, it is gratifying to the Board to state that they have succeeded in obtaining a sufficient number of medals to redeem the pledges given, not only at the last exhibition, but even at the preceding ones, and that a public distribution of them will take place on the 21st instant, and that it will be preceded by an address by a member of the Institute. Those to whom honorary mentions have been awarded, will at the same time receive the certificates which have been prepared for them.

The Journal of the Institute has been continued with every possible attention. The valuable services of our esteemed editor, Dr. Jones, have been secured for a continued period by a new arrangement equally satisfactory to himself and to the Institute, and the difficulties and obstacles produced by his distant residence have been removed by the assiduity of a committee of the Board. The Journal has, during the last year contained more original matter than at any former period. It includes the description of four hundred and seventy-two American patents, with remarks upon their respective merits, and full copies of the specifications, accompanied by plates, were published whenever the importance of the subject warranted it. The patronage which the Journal receives is gradually increasing, though by no means equal to what we would fain hope that it will be after its merits shall be better known and more fully appreciated. It is perhaps not sufficiently known that the Board have, by great exertions, succeeded in making arrangements which enable them to offer a liberal compensation to those authors who contribute communications to the Journal. This arrangement, it is believed, will add much to its merit. The nett increase in the list of subscribers during the last year does not exceed eighty-eight, but it is hoped that by due exertions a larger accession will be obtained.

The Journal has been enriched this year by the publication of meteorological observations; a subject which had been heretofore unattended to, but which in the present state of science should not be neglected. These are interesting, as it is believed that there are very few meteorological tables regularly published at this time in the United States.

The investigations, commenced two years since, on the subject of water power, were carried on with a perseverance and devotion on the part of the committee to which they were entrusted, that entitle the results which they have obtained to the fullest confidence. That the range of their inquiries was extensive, and the attention bestowed upon each part, minute, will appear from that portion of their report which has been laid before the public. Those who had expressed surprise at the length of time which elapsed, before the commencement of the publication, have ceased to wonder at it, since the extent of their calculations has become manifest. The published part of the report already includes sixty pages, and contains the results of 694 experiments, the effect of each of which has been subjected to minute calculation. The residue will be published with as much rapidity as can be done, consistently with the numerous engagements of the gentlemen who are preparing the report.

The committee charged with the investigation of the causes of explosions in steam boilers, have also been zealous in the pursuit of the subject entrusted to them. An extensive diffusion of their circulars produced an accumulation of reports and communications, some of which contain much instructive and interesting matter. As the curious facts which it embraces seem to deserve immediate publication, a selection was made from the mass, and the publication has been continued for several months; adding, it is believed, to the interest of the Journal. In addition to this, the committee have made experiments upon many of the points which were deemed deserving of particular investigation, and have expended about one-half of the fund which was placed at their disposal for that purpose. It is hoped that the whole of the experiments will be completed in the course of a few months, when their results will be brought before the public.

The Institute have also commenced an investigation of much interest, into the resources of our great commonwealth, considered in relation to its industry and manufactures. It is one of the peculiarities of a country situated as ours is, that the constant increase of its wealth and population, as well as the great fluctuations produced by it, renders the task of collecting statistical information extremely difficult, while at the same time it becomes the more important. With a view to contribute their aid in this respect, and disavowing all considerations not strictly scientific, the Institute have raised a committee for the purpose of attending to this subject. The Board merely introduce a notice of it here, in order that their report may embrace a connected view of all the subjects which receive the attention of the Institute.

For the same reason, they would state that, it having been ascertained that a representation to the Secretary of State on the subject of the existing patent laws would be kindly received, a committee was raised in the Institute for the purpose of addressing a memorial to him on that subject, and that there is reason to hope that at an early day, the existing system, which is confessedly very defective, will be considerably improved.

The library of the Institute is receiving some additions; and the accessions by way of purchases, exchanges, and donations, are such as to give it increasing value. The reading room is daily becoming more attractive, and forms a useful point of union for our members.

The Board regret that the limited means of the Institute do not admit of giving to the library that extension which its importance deserves. The subject must be borne constantly in mind, in order that advantage may be taken of any favourable contingency.

The collection of models and minerals is in the same condition as at the last annual meeting. It is to be regretted that the finances of the Institute do not admit of any appropriation for their increase, but the Board recommend it to the zeal and liberality of their members to lose no opportunity of securing its extension.

Experience has proved the inconvenience attending the want of a collection of the objects that are used in the arts as raw materials, or that result from the various operations practised in laboratories and workshops. To the lecturer on chemistry, such a collection would be of immense advantage, and to the students it would be highly useful by bringing many objects before their eyes, and stimulating them to inquire into their nature and properties. Such a collection would not be expensive, but would require much time and assiduity to complete it. It is understood to be anxiously called for by our professor of chemistry, and the Board recommend it to the early attention of their successors in office.

There is a committee of the Institute, the duties of which are of the utmost importance, and which has, it is believed, been of some benefit to many respectable and ingenious mechanics: we allude to the committee charged with inquiring into all inventions submitted to them, and reporting upon their merits. Its duties are delicate and difficult, but they have hitherto been conducted in a manner to be useful to the applicants, avoiding all causes of offence to those whose inventions they are unable to commend. During the past year many applications have been made to them, most of which have been disposed of by reports.

This committee, as well as most of the standing committees, hold stated meetings once a month at least, and some even once a week. These frequent meetings, although consuming much time, are found to advance very much the interests of the various departments committed to them.

The Board have pleasure in informing the Institute that the diploma of membership, which it is understood has been anxiously wished for by many of the members, has been executed in a manner which they think will be creditable to the taste of the Institute, as well as to the state of the arts in our country. It will be ready for distribution among the members, as soon as a sufficient number of copies can be printed and prepared.

There is an object to which the attention of the Institute was called at the time of its origin, and which it has not yet had the means of carrying into execution. Its importance, and the calls for it, are, however, increasing from day to day. We advert to a chemical laboratory, devoted to practical operations, either in analytical or technical chemistry. There is at present no such establishment in the city; we believe there is none in the United States. In a place where the arts and manufactures are daily extending in importance and value, the want of it is greatly felt. Our lecturers on chemistry have their time too much occupied by the preparation of experiments for their lectures, to be able to attend much to the practical instruction of pupils. The few professors, who are disposed to receive youths in their laboratories, make this, at most, but a secondary object; it is with them rather a matter of favour than of business. The advantages which France has derived from the able chemists that were instructed in the ancient laboratory of the Royal Mint, and in the more recent ones of Vauquelin, and of the Royal School of Mines, are too well known to require comment. The expense of fitting up such a laboratory would probably not exceed 1000 dollars, and would be amply repaid by the benefits which it would produce. There is not at present a place in which a person having a specimen of the most common iron or lead ore, can have it tested, or its value ascertained. A member of this Board, who at one time pursued this subject professionally, but who has relinquished it entirely, states that he has had more applications during the last year than he had during the four years that he kept a laboratory open in this city for that purpose. It is not improbable that if one were now established, and placed under the care of a skilful and competent individual, the expenses of it might be defrayed by a very reasonable charge for the instruction of pupils, and a small fee on all minerals and other matters brought for analysis or examination. To the community at large, the benefit would be very great, and to the Institute the establishment would be highly creditable. The Board recommend it to the early attention of their successors in office.

During the last year, the Board have elected 264 new members, and have received the resignation of twenty; making an accession to our members of 244, from which however some deduction must be made for deaths and removals not regularly reported to them. Among the deaths, the Board regret to number that of Mr. Joseph H. Schreiner, who for the last five years was one of their associates.

The report of the treasurer hereto annexed, exhibits an account of the receipts and expenditures during the past year, leaving a balance in his hands on the 10th inst. of $\$478\frac{77}{100}$, against which, however, must be placed the outstanding orders drawn by the Board amounting to $\$818\frac{85}{100}$, and leaving a deficiency of cash of $\$340\frac{08}{100}$ to be paid out of the future receipts of the treasury.

During the last year the following gentlemen have become life members.

Anthony Finley,
Thomas Scattergood,
Robert Hoare,
Wm. B. Fling,
Rudolph Dietz,
M. D. Lewis,
J. J. Kates,
Michael Kates,
C. M. Eakin,
W. J. Young.

The Board have not overlooked the necessity of continuing the salutary measures adopted by their predecessors for the reduction of the heavy debt incurred in the erection of their hall; and besides paying all dividends that were claimed to the amount of $1515, they have added the sum of $\$1053\frac{58}{100}$ to the sinking fund, which now amounts to $\$7398\frac{81}{100}$, reducing the debt to the stockholders to $\$26601\frac{19}{100}$.

All of which is respectfully submitted, by

(Signed,) M. D. Lewis,
Chairman.

William Hamilton, *Actuary.*
Philadelphia, January 18th, 1832.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN AUGUST, 1831.

With Remarks and Exemplifications, by the Editor.

1. For *Uniting Cast Iron with Steel and Wrought Iron;* Asa Mallory, and Charles Miles, Concord, Geauga county, Ohio, August 1.

The proposed union is to be effected by bringing the piece of steel or wrought iron to a red heat, then placing it in a mould, applying to it brimstone, or borax, calcined with arsenic, with the addition of sal ammoniac, and pouring the cast iron on it. Or, the piece of steel and cast iron to be united are both to be brought to a red heat, and pressed together with some of the composition between them. Those who unite the metals in this way must use them gently, or the sulphuret of iron by which they are cemented, will assuredly give way. The process is neither new nor of any value.

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2. For an improvement in *Lamps;* Isaiah Jennings, city of New York, August 1.

(See specification.)

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3. For *Locks for Rifles,* called the "percussion side lock;" Elisha Strong, Clarindon, Geauga county, Ohio, August 2.

We have examined the description, drawing, and model, forwarded by the patentee, and with all these aids remain as ignorant of what he intended to patent as we should have been had we not seen either. The modle consists of something like a trigger, which is, probably, to be fixed upon the side of the stock.

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4. For *Applying Horse Power for Propelling Machinery;* Calvin Emmons, city of New York, August 2.

A wheel twenty or thirty feet in diameter, and placed horizontally, is to be turned by a horse. The wheel, so called, consists of a strong nave, or hub, with six or eight arms, ten or fifteen feet long, projecting from it. The hub has an axis passing vertically through it, which axis is fixed firmly in a piece of timber placed beneath it. There is no rim to the wheel, but the spokes are braced together by pieces passing from one to the other, at about one-third of their length from their outer ends. This allows of a space between the projecting ends of the spokes for the horse to walk in; the wheel standing no higher from the ground than is necessary for the draft of the animal, and the traces being attached to one of the spokes. The ends of the spokes are notched, to receive a band, they being intended to operate as a band wheel; this band extends out, and passes round a whirl, from which motion is to be communicated to any machinery which is to be propelled. The claim is to the construction and arrangement of the several parts of this apparatus. Its superior advantages we do not perceive.

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5. For machinery for *Jointing Staves;* Isaac Fobes, Bridgewater, Plymouth county, Massachusetts, August 3.

This jointing machine consists of a wheel turning horizontally, through the upper side, or face, of which project four, or any convenient number of irons, or cutters, passing in from below in the manner of plane irons. The face of this circular jointer is made concave from the outer towards the inner edge, the irons being adapted to this curvature; which is such that when the edge of a stave is placed upon it, the jointing shall leave it with the proper swell in the middle.

A rest is provided, against which to bear the stave whilst jointing.

The claim is to the principle upon which the machine operates, or, in other words, to the concave faced revolving jointer. Among the many jointing machines which we have seen and described, there certainly is not one which operates upon this principle. The only objection which we see to it is that the irons work against the grain for one half the length of the stave.

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6. For improvements in the *Mode of Kiln Drying Wheat Flour, and other kinds of Meal,* by the agency of heated air, or of steam, operating in an apparatus adapted to the purpose; Nathan Tyson, city of Baltimore, August 8.

We are waiting the result of some experiments now in progress by the patentee, which when completed will be published with the specification and an engraving of the apparatus.

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7. For a *Screen for separating Grain from the Straw,* called the horizontal revolving jointed screen; Peter Broughton, Charleston, South Carolina, August 5.

An endless apron is to be made of wove wire, which is divided into segments held together by leather straps; each segment is to be of such a width as to correspond with the flat sides of two hexagonal rollers, by which the endless apron is made to revolve. The straw and grain, as they leave the thrashing machine, are to be conducted in between the two sides of the revolving apron, at its upper end, which is a little elevated above the delivering end. The grain is to fall through the screen, and to be conducted to a winnowing machine, and the straw, when it arrives near to the second roller is to be thrown off the screen by a sloping board placed for that purpose. There is no claim made.

8. For an improvement in the common *Pump* for pumping water, Jesse Reed, Marshfield, Plymouth county, Massachusetts, August 5.

The chamber, and the whole of that part of this pump which is above ground, is to be of cast iron, and is to be attached to the descending shaft by a flanch with suitable bolts, allowing it to be removed with ease for the purpose of examination and repair. There is to be a thumb screw which, by being turned, will raise the valves, let off the water, and thus prevent freezing. There is but little of tangible novelty in the whole thing, and the patentee appears to be rather uncertain about his claims, as he makes them with this proviso, "unless the same have been used without the knowledge of your petitioner."

9. For an improvement in the *Piano Forte Action;* Jesse Thompson, city of New York, August 6.

A lever, called an angle lever, is applied directly to the key and hammer, causing the blow to be struck the instant the key is moved. Judging by an inspection of the drawing, we should form a very favourable opinion of this action, which is much more simple and direct than those commonly constructed. The claim is to the angle lever alone.

10. For an apparatus to *Filter Sirop, and wash the animal-black, and other substances used for clarification;* Thomas Osenard, a citizen of the United States, now residing at Marseilles, in France, August 6.

This apparatus is intended principally for the use of sugar refiners and confectioners; it is complex, but is well represented on two lithographic drawings which accompany the specification. We shall not attempt a description of it, as without the plates it could not be made clear.

11. For a *Washing Machine;* Nathan Hackett, Green, Clinton county, Ohio, August 6.

This machine, we are told, is to wash with or without steam. The box, or trough, to contain the clothes, has its lower part semicircular. A shaft suspended from the centre of the curve has two wings, or levers, upon it, which vibrate in the box; these wings are perforated with holes to allow the water to pass through. A stationary partition in the centre of the box, divides it into two parts; this partition also has perforations similar to those on the moveable wings. A vibratory motion being given to these wings by means of a crank on the shaft, the clothes are thus squeezed between them and the stationary partition. There is no claim made.

12. For *Graduating Moulds for moulding and shaping*

Timbers for Boats and other vessels; James Wallace, Rochester, Monroe county, New York, August 9.

By the invention here patented it is intended to make one set of moulds answer the purpose of laying out timbers for vessels of all sizes. The moulds are to be divided, to have moveable joints and gauges, and to be kirfed in a way particularly explained and laid down in the drawing. The whole arrangement must be shown in order to give a correct idea of the inventor's plan.

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13. For a *Machine for hulling and cleaning Clover Seed;* Lemuel White, Adams county, Pennsylvania, August 9.

This clover machine is to be made pretty much like the ordinary cylinder thrashing machine, but it is to have two cylinders and two concaves adapted to them. The cylinders and concaves may be made of cast iron or of wood, and be covered with emery; or they may be covered with cards, so fixed that the teeth shall point with the motion of the cylinders, which is to be with their upper sides receding from each other. There must be a hopper for feeding, and a riddle and fan may be placed below, and moved with the machine.

The claims are to the use of two cylinders and concaves, the cylinders revolving as described; the mode of gearing; the plan of placing the cards, and of coating the cylinders and concaves with emery.

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14. For an improvement in the machinery for *Making Biscuits and Crackers;* John S. Stiles, city of Baltimore, August 9.

The dough is to be worked by a break, made very much in the manner of that now used, with angular slats striking upon it. The table upon which the dough is placed is to have a vibrating top, operated upon by a cam, that the breaks may not strike a second blow on the same place.

After being otherwise prepared the dough is to pass between two or more rollers, to reduce it to a proper thickness. It is then to be received between two other rollers, one of which is to have circular cutters, with proper dockers and letters, and the other may be covered with leather or any suitable substance. In each of the moulds there is placed a sliding piston, perforated for the dockers to pass through. This, by its weight, or by the action of a spring, causes the biscuit to fall out of the mould after it escapes from between the rollers.

The patentee acknowledges that all the parts described have been used before, "but not in the same connexion, or applied to the same purpose;" and claims the combination and application as described. On the 13th of June last, (vol. viii. p. 343,) Messrs. Fairlamb & Dunott, of Wilmington, Delaware, obtained a patent for a machine in which they apply some of the same parts "in the same connexion" "to the same purpose," and they expressly claim the moulding and docking by cylindrical pressure.

15. For an improved *Stock;* William Carlock, city of Baltimore, August 9.

This stock is to be cut in one entire piece out of hair cloth, with cotton or silk warp. After being cut it is to be stiffened with starch, or some similar substance. It is to receive its proper shape by being bent round a heated mould of the proper form, upon which it is to remain until dry. If the warp is of silk, it may be trimmed without first covering it; if of cotton, it may either be japanned or covered with any suitable material.

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16. For an improved *Standing Press;* John H. Stewart, county of Philadelphia, Pennsylvania, August 11.

This standing press is to have screws on each side instead of cheeks. Upon these screws are fitted nuts capable of turning, and which are to be attached to the platten, or follower, with a swivel joint. Upon each of these nuts, or screw boxes, there is to be a cog wheel, and between these a pinion gearing into each of them. The shaft of this pinion will be vertical, and on it may be placed a crown or bevel wheel, which may receive motion from a pinion upon a crank, the shaft of which runs in bearings upon the top of the follower. By turning this crank vertically, the nuts will be made to ascend and descend upon the screws, and any desired power may be obtained, according to the proportions observed in the gearing. Several variations of the principle are alluded to; this particular mode of constructing, or rather of gearing, the press, not being the object of the patent. We are told in the commencement of the specification, that "the improvement consists in constructing the press in such a manner as to dispense with the posts, or upright parts of the frame, and so that the power may be applied vertically." In the claim at the end of the specification, we are informed that the parts believed to be new, and constituting the invention, "are the construction of a standing press without the use of posts or upright timbers in the frame; the screw bolts so arranged as to operate as posts or supporters to the upper part of the press, at the same time that they perform the operation of screws. And also the application of power to a standing press in a rotary vertical manner, by the means of wheels and pinions, with handles, levers, cranks, or other fixtures for the application of the power."

At page 346 of the last volume there is a specification of a patent granted to Charles Evans, of Philadelphia, on the 13th of June last, which fulfils most of, if not all, the conditions of the above claim. Mr. Evans expressly claims "the application of screws instead of cheeks to the sides of the standing press." He also turns his gearing by means of a handle or crank "in a rotary vertical manner." The only noticeable difference is that Mr. Evans uses an endless screw in preference to a pinion, but the question of identity can scarcely rest upon the difference here noticed.

17. For applying *Zinc, or Spelter, to the making articles of various kinds*; Samuel Davis, city of New York, August 11.

The patentee tells us that he has made the discovery that weights of from one ounce to fifty-six pounds, may be made out of zinc; and also that book binders' plates, chaffing dishes, portable scrapers, baking plates and griddles, may be formed out of the same substance, and therefore prays that he alone may have the right to make the articles thus specified.

There is something really curious in the progressive discoveries of the patentee of the above articles of zinc. By a patent dated October 1, 1830, (vol. vii. p. 368,) it appears that he had then discovered that milk pans might be made out of zinc. Another, dated April 18, 1831, (vol. viii. p. 124,) tells us that he had in addition discovered that many articles of hollow ware for cooking, as well as others for use and ornament, might be so made; and it will be seen above, that he has made further discoveries of a similar character, and one of the number is, that weights as low as an ounce, and as high as fifty-six pounds, may be made of zinc. If these are patentable discoveries, the iron founder may patent every article which he casts in a new form, and close the furnaces of all competitors.

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18. For *Shears for cutting Paste Board, Sheet Iron, &c.;* Alvah Hardy, city of Boston, Massachusetts, August 12.

The inventor calls these shears "curved edge shears." He makes them in the usual manner of those shears which have the fulcrum at the end, and he curves one or both edges, in such a degree as to cause them in cutting to meet at nearly the same angle throughout their whole length. When the curvature is given to one edge only, it is to the upper one. A weighty knob is to be formed on the end of the handle to assist, by its gravity, in cutting.

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19. For a machine for *Hulling and Cleaning Clover Seed;* William Williams, Buckingham, Bucks county, Pennsylvania, August 12.

There is a feeding apron upon which the clover is laid, and by which it is carried towards the body of the machine; the clover falls from off this apron into a vertical opening, situated between a revolving fan wheel and the hopper. Stones, sand, and other heavy articles descend entirely through this opening, as do seeds which are heavier than the clover, whilst the latter is driven by the air from the fan up an inclined plane into a hopper. Below the hopper there is a revolving cylinder, covered with sheet iron, and set with fine teeth; this revolves within a hollow segment which embraces nearly three-fourths of its circumference. This segment is also set with teeth, excepting the last portion of it which is punched so as to form a grater. The cylinder and segment are adjustible by wedges.

The claim is to the peculiar arrangement of the parts as described.

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20. For a *Machine for Gumming and Trimming Saws;*

Joseph Spencer, Canajoharie, Montgomery county, New York, August 15.

If those persons who have taken patents for machines for gumming or cutting the teeth of saws, had visited the manufactories where these instruments are made, they would have discovered that the manufacturers know as well as any body, how to cut saw teeth; and that the machines which have been patented are mere variations, or modifications, of such as are well known. The one before us is in fact a bed and punch, with a gauge for regulating the distances of the teeth, acting upon principles, and in a manner, long in use.

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21. For a machine to give an *Alarm when a Building takes Fire;* Ithiel S. Richardson, New Market, Rockingham county, New Hampshire, August 15.

An alarm bell is to be attached to suitable wheel work, which, when acted upon by a weight suspended from a barrel, will cause a hammer to vibrate within the bell, and sound the alarm. From this apparatus, a string extends to the different apartments of the house, being conducted round angles by means of pulleys; this string is attached to, and supports a weighted lever, which checks the barrel of the wheel work, but if the string be burnt off in any part, this weighted lever will be liberated, and the alarm sounded.

A particular manner of combining and arranging the apparatus is described, and represented in the drawing, and the claim is to the mode of arrangement described. Any one, who is well acquainted with machinery, could devise modes very different from that given by the patentee. He, however, was probably aware of the fact, that the same principle, the burning off of a string, had been applied to the sounding of an alarm in case of fire, and thought it best, therefore, to confine himself to his own particular plan.

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22. For a machine for *Edging Metallic Plates for Roofing;* Daniel A. Piper, Cincinnati, Hamilton county, Ohio, August 15.

Two stout pieces of plank are to be hinged together like double shutters; upon the hinged edge of one of them, a rebate is to be formed, which may be covered with iron, and upon the edge of the other piece of timber an iron plate is secured by screws. The tin to be edged is slipped into the rebate, when the timbers are folded together, and the edging effected. This, the patentee tells us, is a much better mode than the old one, which required the use of a hammer; we can assure him, however, that it is a much worse mode than that supplied by other machines which have been invented for the purpose, and which do not require or admit the use of a hammer. Such machines, it seems, have not yet travelled to Cincinnati, although they are well known in the northern states.

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23. For an improvement in *Brick Moulding;* David Fox, Ashtabula, Ashtabula county, Ohio, August 15.

This machinery is too complex to be described in words, excepting in a very general way. There is a hopper into which the prepared clay is to be put; under this hopper the moulds are made to pass in succession by the action of a lever, the empty moulds pushing the full ones forward, whilst another lever gives motion to a follower and other apparatus which forces the clay from the hopper into the mould, and also operates upon a scraper which removes what is superfluous.

The claims are to the strike and press as constructed in this machine, and also to the scraper, the forcer, the peculiar angles of the two levers, and some other parts which it is unnecessary to mention.

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24. For *Machinery to be applied to Grist Mills, Saw Mills, &c. &c.* called the 'roller and balance wheel power;' Joel Ester, Brownsville, Haywood county, Tennessee, August 15.

This machinery is to be the guide, governor, and director, of machinery in general, as it is to be a first mover to drive mills of all kinds, and to propel boats. It is proposed, in most cases, to use the power of a horse to communicate the first motion, as in the common horse mill. From the large horizontal wheel which the horse turns, wallowers, counter wheels, large and small balance wheels, an inclined wooden wheel twenty or thirty feet in diameter, and, at the end of this train, a mill of any description, are all to be set in operation. It appears altogether uncertain whether the horse, or any extraneous motive power, will be really required, as, under ordinary circumstances, "one horse gives the power of ten or fifteen." But if the machinery be increased in size, "the large balance wheel being thirty feet, or from that to forty, in diameter, with a heavy rim, and its balance wheels well proportioned, it is believed it will move and turn in *perpetuam* without the aid of a horse."

When an individual is so far gone as to imagine that a machine will move the more readily the more you load it, it is of no use to reason with him, least he turn again and rend you: the only wise course, is to allow him to make his machine, and to load it until either he or his contrivance, is broken.

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25. For an improvement in the *Horse Rake;* William Phillips, Middlesex county, New Jersey, August 15.

The principal improvement in this rake consists in applying four small wheels to it, two at each of its ends. These wheels are of such a size as to keep the teeth of the rake at the proper distance from the ground, whilst they are to take off the friction usually experienced in similar instruments, and to render the draft perfectly easy. By the aid of the handles which serve to guide it, and of others upon which a boy is to operate, the rake is to be relieved of its accumulated load, without checking the motion of the horse.

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26. For an improvement in the *Manufacture of Sugar;* William Augustus Archbald, Sugar Refiner, city of New York, August 16.

The improvement here proposed consists in converting the sirop, or cane juice, into loaf sugar, without first granulating it, and forming it into raw, or other, sugar. The juice, it is said, should be prepared in the way specified in the patent granted to Mr. Archbald in the month of April, 1830; after which it may be boiled down to twenty-six or to twenty-eight degrees of Beaumé's sachorometer, if intended for immediate use; but if for keeping, or transportation, to from thirty-six to forty degrees. When of the lower density, for immediate use, it is to be examined by test papers to detect any acidity, which is to be corrected by milk of lime, prepared in the ordinary way, and added in small quantities until the acid is neutralized.

When perfectly neutralized it is to be put into a boiler, and heat applied until the sirop boils, the heat from steam being preferred. Three pounds of fineings are to be put in in addition to the portion originally employed, as directed in the patent referred to; this three pounds of fineings is the proportion for every thirty gallons of sirop. After boiling for two or three minutes it is to be filtered through animal charcoal; or, instead of filtering, from five to ten pounds of animal charcoal are mixed with the sirop, the boiling stopped, and a quart of bullock's blood thrown in to the above named quantity. When intimately mixed the sirop is to be again heated until the scum rises. Should it not prove perfectly clear, more blood is to be added in the same way. The whole is to be allowed to settle, and is afterwards strained through a filter, Howard's being preferred.

Sirop prepared in the ordinary way, it is said, may also be boiled down and treated according to the same principles, for the purpose of converting it at once into lump, or loaf, sugar.

The advantages of the process are said to be a considerable increase of *fine* sugar from a given quantity of juice, and the saving of much time, labour, and expense.

The claim is to the process by which loaf or lump sugar is made from the cane juice, without first converting it into raw or dry sugar.

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27. For an improvement in *Trusses for the cure of Reducible Inguinal Hernia;* Amos G. Hull, city of New York, August 17.

A patent was first obtained for this truss on the 17th of July, 1817, and last on the 20th December, 1830. Between these dates the patentee surrendered his patent three times, namely, on the 27th of February, 1823, on the 19th August, 1824, and on the 20th October, 1829. The patentee states, however, that his instrument was brought to its present improved state on the 27th February, 1823, and in the petition for his present patent requested that it might be issued to bear date from that time. This, we understand, has been done, and the improvements which he has made incorporated in the amended specification. Notwithstanding the high authority by which, as we are informed, this procedure has been sanctioned, we are fully of opinion that his present patent will be invalidated if examined in court. The patent of February, 1823, dated from July, 1817, having been issued upon a surrender of the first patent, was therefore the same instrument amended, and, of course, it expired on the 17th of July last. By reissuing it, as though the original had borne the date of 27th of February, 1823, the patent is obtained for nearly twenty, instead of fourteen years, the legal term.

Independently of the last consideration, the fact that the patentee has not merely corrected what was error in his former specifications, but has introduced improvements not originally contemplated by him, makes the present, essentially, a new specification. This new matter might, legitimately, have been the subject of a patent for an improvement, but cannot, certainly, be employed to lengthen out claims to that which, by the terms of the patent law, has become public property.

It is probable that before the present number of this journal is printed, we shall have something further to say upon the subject of reissued patents, as we expect the decision of the Supreme Court respecting it.

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28. For an improvement in the mode of *Fastening the Soles and Heels upon a Boot or Shoe*, with wooden or metal pegs, and of paring the same; Wales Tileston, Charlemont, Franklin county, Massachusetts, August 18.

A block is to be prepared of the size of the sole of the boot or shoe, and of such curvature as to fit on to the sole when placed upon the last. This block is to be of a thickness corresponding with the length of the pegs to be driven, and is to be perforated near its edges with as many holes as there are to be pegs. From the back, or upper side of this block, two pins, or tenons, rise, upon which other plates, or blocks, provided with corresponding mortises, may be passed down into contact with the first. A second block, or plate, of the same size with the first, is placed upon it, being guided by the mortises and tenons. This block is perforated with holes corresponding with the first, and has projections from its edges by which it may be fixed to, and hold the work fast in, a frame.

A third block is prepared, with mortises to slip over the pins, or tenons, and with as many awls fixed in it as there are holes in the other blocks; they must be of sufficient length to pass through the two former blocks and to perforate the soles; to effect which any adequate power may be applied. When this block, containing the awls, is removed, pegs are dropped into the holes, and a block filled with blunt pointed wires, instead of the awls, is then applied and made to press upon the pegs, and drive them into the sole. This last block may be surrounded by a knife, or cutter, which, whilst the pegs are forced down, will pare the sole. A similar apparatus is to be used for the heels.

There is no claim made.

A patent was granted to Nathan Leonard of Merrimack, New Hampshire, June 11th, 1829, for a mode of pegging essentially the same with the foregoing. An account of the invention will be found at p. 180, vol. iv. The first perforated plate, a plate with awls, and one with blunt wires, are all particularly described in that patent.

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29. For a *Wheat Rubber, for cleaning Grain;* David Marracong, Skaneateles, Onondago county, New York, August 18.

Sheets of iron, perforated with holes so as to form rubbers, like graters, are to be nailed upon wooden planks, and the upper one is to receive a vibratory motion by means of a crank and pitman. Cleets are to be placed along the edges of the rubbing boards, to keep and guide them in their places. The grain is to be let on by a suitable spout.

There is no claim made, and the apparatus is so similar to what has been before used, as scarcely to leave room for any.

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30. For a machine for *Sawing Shingles,* Clap Boards, &c. Jonathan Hobbs, jr. Falmouth, Cumberland county, Maine, August 18.

We shall not attempt to give any idea of this machine further than to say that a circular saw is used in it, and that there is an apparent complication of parts about it, which would require more time and attention for its examination than we can at present devote to it. The specification itself is five yards long, and closely written, and refers throughout to numbers upon the drawing. Without this, therefore, the ideas of the patentee could not be made known; and as these do not appear to extend to any thing new in principle, but to be confined to the special arrangement of the respective parts, we pass them without further notice.

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31. For a *Washing Machine;* John Shull, New Petersburg, Highland county, Ohio, August 19.

This is a steam washing machine, and not very different from several others already patented. The body of the machine is in the form of a barrel churn, and is placed on trussels. There is a cover fitting closely at the top of this barrel; within it a shaft revolves, carrying an interior cylinder, perforated with holes, and operating like the dashers of a churn. The clothes are to be put within this inner cylinder through openings prepared for the purpose. There is a boiler with a safety valve, and a steam tube leading through the end of the outer vessel. The operation need not be further described.

The claim is to the formation of the inner revolving cylinder, and the admission of steam in the manner described.

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32. For a *Washing Machine;* Webber Furbush, Hallowell, Kennebeck county, Maine, August 19.

This is a true old fashioned washing machine, consisting of a trough the bottom of which is curved, and over which rollers, set in a proper frame, are made to vibrate, and pass over the clothes placed upon the bottom. This bottom the patentee calls a smooth apron, and he very boldly claims nearly every part of the machine. He says, "I claim the use of the rollers in the side pieces—I claim the use of the smooth apron—I claim the mode of applying these to use in a box or tub."

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33. For an improvement in the art of *Distillation;* John Cairou, city of Boston, Massachusetts. Patent first issued January 10, 1831; surrendered on account of a defective specification, and reissued August 22.

We remarked upon the original specification of this patent at p. 304, vol. vii. to which article we refer; the reference to a model throughout the specification, was particularly noticed, and it is now said that " the errors which render the existing patent defective, are a reference to a model of Mr. Cairou's machine for explanation of various parts of it, which are not sufficiently described in consequence of his supposing such a reference, (viz. to a model,) would supply the deficiencies of description—and other errors of similar character."

Mr. Cairou observes that although he is the original inventor of the column described in his specification, he does not now claim letters patent for the same, as detached and separate from the other parts of the apparatus; but what he claims is the combination of the several parts, to produce the effect described.

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34. For an improvement in the *Turnabouts for Rail-roads;* James Stimpson, city of Baltimore, Maryland, August 23.

The *turnabouts* for rail-roads are circular platforms large enough to receive a rail-road car, and placed level with the track. By their means a car can be turned entirely round, or into a road crossing that upon which it originally stood.

Turnabouts have been patented in this country; (see vol. vi. p. 291.) When Mr. Fairlamb's patent was issued, we were not aware that such turnabouts had been already introduced in England, but this being the fact, the patent here was not valid, although the patentee might have been a real, though a second, inventor. The present patent is taken for improvements upon the mode of forming them; some idea of the nature of which improvements may be derived from the claim, which is as follows:

" What I claim as my invention or improvement, is the application of cast iron for the platform of the turnabout, in form aforesaid, or any other manner. Also the construction of turnabouts as above set forth. Also the double tracks on turnabouts at right angles with each other, as herein set forth. Also the cheek bolts for fastening turnabouts in their proper positions by its own movement, caused either by gravity, or otherwise, for any kind of turnabouts. Also the stone or brick curbing surrounded with iron plates, as above set forth, or otherwise. Also the connecting the track rails with those under them, and the transverse timbers for security against frost, &c., as used as the foundation of turnabouts, as above set forth, or otherwise."

We think the above claim rather too comprehensive and sweeping throughout; we doubt the validity of a claim, for example, to the application of cast iron for the platform, in form aforesaid, *or in any other manner*, &c. &c.

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35. For an improvement in the construction of *Wheels for Rail-road Carriages;* James Stimpson, city of Baltimore, Maryland, August 23.

It is observed in the specification that the side of a wheel to which the flanch is attached, is much the strongest, whilst the opposite side is the most subjected to those accidents which tend to break the wheel; the improvement proposed is to strengthen this side of the rim by a ring of additional metal in the casting; and the patentee says he has no doubt that fifteen pounds of metal, forming such a ring will give more additional strength to the wheel, so as more effectually to protect it from breaking, than one hundred pounds equally distributed throughout the whole of the rim.

The claim is to "the application of the rim, ring, or felloes, inside of the tread, or rim, or inner periphery of the wheels, opposite to the flanch."

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36. For an improvement in the mode of *Ascending and Descending Rivers, and Canals, or Inclined Planes,* using such steam engines, or other locomotive power on board, or within the vessel, or vehicles to be moved, as may be found necessary for their ascent or descent; James Stimpson, city of Baltimore, Maryland, August 23.

Firm fixtures are to be made at the upper and lower ends of the planes which are to be ascended or descended, and chains, which may be of the kind used for cables, are to extend from one to the other of them, being supported on the ground, or on fixtures placed for that purpose. A shaft is to extend across the ways of the inclined plane, and when there is a chain on each side of the ways, there are to be cast iron pulleys on each end of the shaft; which pulleys are to be so cast that the links of the chain may fit precisely into them, there being hollows in the middle of them, and indentations in their cheeks, or flanches, for that purpose, which will prevent the chain, as it lies upon them, from slipping. There may be three, or more pulleys, of different sizes, to be used in different ascents. By means of cog wheels, with which the vessel, or carriage, is to be provided, power is to be derived from the steam engine, or animals, &c. within the vessel, to act upon the shaft carrying the pulleys, and thus to make the desired ascent.

The specification, which goes much into detail, includes a great variety of propositions, but the following are the claims made. "The application of chains to ascend and descend upon rivers and canals, or inclined planes on rail-roads, or otherwise, said chains being made fast at both ends near the foot and top of the inclines, and resting upon the ground or other material, or at suitable places in rivers or canals, the locomotive, or other engines, drawing themselves up, or letting themselves down said inclines, rivers, or canals, by the power which is on board of themselves by the agency of pulleys in contact with said chains, as set forth in this specification, *or in any other way;* also the variable speeds or powers as herein set forth, *or in any other way.* For locomotive carriages on rail roads, not using the chain, I also claim the application of machinery to change the moving power from the road wheels of locomotives upon rail-roads where the inclination is too much for the adhesion of the wheels to the rail plates to allow them to ascend or descend without slipping or sliding upon said rails, to a pulley shaft as aforesaid, or any other thing whereby said purpose is used in a different manner than in immediate contact with the road wheels, or their axles, as set forth in this specification."

We might here repeat a portion of the remarks made on the last specification, as we think the present claim much too broad. The plan itself, however, appears to us to be altogether impracticable in the form presented, and its details exhibit a want of knowledge in the most advantageous modes of applying power.

37. For an improvement in the *Mode of turning short curves on Rail-roads,* such as the corners of streets; James Stimpson, city of Baltimore, August 23.

The plan proposed is to make the extreme edges of the flanches flat, and of greater width than ordinary, and to construct the rails in such a manner that where a short turn is to be made, the extreme edge of the flanch shall rest upon it, instead of upon the tread of the wheel; thus increasing the effective diameter of the wheel in a degree equal to twice the projection of the flanch. The claim made is to "the application of the flanches of rail-road carriage wheels, to turn short curvatures upon rail-roads, or tracks, particularly turning the corners of streets, wharves, crossing of tracks, or roads, and passing over turnabouts, &c.

On turning to pages 270 and 271, vol. iv. there will be found specifications of two patents granted to James Wright, of Columbia, Pennsylvania, for the mode of turning curves claimed by Mr. Stimpson. The only difference is, that Mr. Wright proposes to adopt his cars to several different curves, by having three, or more, offsets in his wheels, when necessary.

38. For an improved mode of *Opening and Shutting Switches on Rail-roads;* James Stimpson, city of Baltimore, Maryland, August 23.

Those who know any thing of rail-roads are aware that what are called switches, are pieces of iron employed at turn out places, which pieces, or bars of iron, have to be opened and closed, according to the track upon which the carriage is to travel, and that accidents have frequently occurred in consequence of the switches not being opened or closed as required. The plan proposed in the specification of the above patent, is to arrange certain levers, and other machinery, so that a piece projecting from the carriage shall operate upon the switch and give to it its proper direction, either by day or night, without personal attention on the part of the person having the care of the carriage. The claim is to "the application of machinery to open and shut switches, whereby the drivers of carriages, or superintendents of locomotive engines, or others, without stopping, or leaving their seats, carriages, or horses, can open and shut switches, *if in order*, by night, or by day, without seeing them, by machinery, as set forth in the above specification, *or in any other way or manner.*"

The contrivances proposed, "if in order," might answer the purpose, but from their complexity, we apprehend that they would prove to be traps rather than protectors.

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39. For an improvement in the mode of *Forming and using cast or wrought iron plates, or rails, for Rail-road Carriage Wheels to run upon;* James Stimpson, city of Baltimore, Maryland, August 23.

The claim in this case is to "the application of cast or wrought iron plates for the use of rail-ways on the streets and wharves of cities, or elsewhere. The objects of said improvement being to employ rails that will not present any obstacles to the ordinary use of streets, or sustain injury therefrom, and so to form the plates at the intersections of streets, or other crossings, that cars will readily pass over them, and also on circles of small radius."

The rails are to be formed with a groove in them to receive the flanches of the wheels; on one side of the groove, the width is to be sufficient for the tread of the wheel; on the other, it need not exceed three-quarters of an inch. These rails are to be laid flush with the pavement of the streets. At corners to be turned the rails are to be cast, or made of the proper curvature, one of them only being provided with a groove, as the flanch is to run upon the other, upon the principle described in No. 37. Provision is to be made by scrapers, or brushes, preceding the carriages, to clear the grooves of dust, ice, and other obstructions.

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40. For an improvement upon *Dearborn's Patent Balance;* Uel West, and Daniel Loring, city of New York, August 23.

The alteration or improvement here patented, consists in so making the beam of the steelyard, or balance, as that the hook upon which the scale, or article to be weighed, is hung, shall be much nearer to the fulcrum than it has hitherto been placed in Dearborn's balance. For this purpose, it is sustained upon a pin between two cheeks, almost directly under the fulcrum. The object to be accomplished is to weigh a given weight with a beam much smaller than usual. The patentees state that a beam then before them, will weigh twenty times as much as any other of the same size.

There can be no doubt that the end proposed can be obtained by the prescribed means; but one other thing is equally certain, namely, that the accuracy of the instrument will be sacrificed in a degree exactly proportioned to the extent to which this improvement is carried.

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41. For an improvement in the *Machine for weighing Canal Boats, Loaded Wagons, &c.;* Daniel Loring, Newark, New Jersey, August 23.

The general principles of this machine are well known to engineers. The claim made is to the form and general arrangement of the combination of levers of which it is principally composed; and the steel edge bearings, the bearings heretofore used being points, which soon wear out, and require to be repaired or renewed, whilst edges, well made, will work equally well, and are much more durable.

The use of edges for the fulcra of such weighing machines, is not new. Those patent weighing machines made by Mr. Ellicot, of Philadelphia, have steel edges.

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42. For an improved portable *Smut Machine;* Henry Weed, and Stephen Fellows, Sandwich, Strafford county, New Hampshire, August 23.

This smut machine is much like some others, and the improvements claimed to have been made by the patentees do not essentially alter it.

A box or chest is to be made to contain the machine. A cylinder, about twelve inches in diameter, and four in height, is made to revolve vertically, by a strap passing round a whirl on its shaft. This cylinder may be left smooth, or it may be covered with sheet iron cut into strips, or brads made rough, or nails in clusters, may be driven into it. A sheet iron cylinder, punched from the outside, so as to form a grater within, is to surround, and stand at a suitable distance from the revolving cylinder; between these, of course, the grain is to pass, the feed being from a hopper, the grain falling from it on a seive, and from that on to a second seive, kept in motion by a crank. A fan also is kept in motion, to blow away the chaff and dust.

What is claimed as new, is "the placing the machine in a chest. The shape of the brads. The making them rough. The manner of placing them in the cylinder. The driving of the nails in clusters. The cutting sheet iron into strips, and making them rough like rasps."

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43. For a *Saw Trimmer;* Adam Clark, jr., Berne, Albany county, New York, August 24.

This saw trimmer, or instrument for gumming saws, as it is usually called, purports to be an improvement on a similar instrument patented by John R. Fairling and Robert G. Nellis, April 27, 1831. We are told that instead of making it in detached pieces, and fastening them together by a screw and nut, as they did, the present instrument, though similar in form to theirs, is made somewhat larger, and in one entire piece of cast iron. The claim is made to the foregoing improvement.

In our estimation, neither of the patents is of any value, because we do not think them new. The specification of this last patent places in a strong point of view, the trifling change upon which many persons imagine a patent may be founded. The drawing of this instrument, and of that noticed at No. 20, are strikingly similar.

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44. For a machine for *Cutting Laths from Boards;* Jacob Jameson, Springfield, Clarke county, Ohio, August 24.

This machine consists, principally, of two rollers, between which the board to be cut into laths is made to pass. The lower roller is smooth, and merely sustains the board. The upper roller is furnished with circular knives of about four inches in diameter, passed on to an iron shaft, with collets between them to regulate their distances. There are two cranks, one at each end of the roller containing the knives, and the turning of these cranks draws the board through, which is delivered in the form of laths. The frame for sustaining the rollers, and guiding the board, we need not describe. We presume that the boards are to be first sawed to the *thickness* of the laths, and that they are only cut to a *width* by the knives, and the drawing also seems to indicate this. Such knives would not cut through an inch board of the softest wood, so as to form it into laths.

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45. For a *Plough;* William Savage, and Hezekiah Davidson, Barren county, Kentucky, August 24.

The plough looks pretty much like other ploughs, and we apprehend that all the improvements of which this instrument is susceptible, is in its details. In the present instance, the claim to improvement consists in "the wing and bar being in separate pieces, and confined by a nib and socket together, with a horizontal screw entering through the wing, mould board, and upright," "so that by taking out said screw, the wing can be taken off and sharpened, or laid, as easily as a common weeding hoe, leaving the bar always fast to the stock; the regulator, also, to make the plough cut deeper or shallower; all these things we claim."

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46. For a method of *Propelling Boats*, and various kind of machinery, called the "self-supporting chains;" Billy Todd, Marietta, Washington county, Ohio, August 24.

When Redheffer's perpetual motion refused to go, a gentleman who had formerly been numbered among its advocates, when reminded of his former opinion, observed that he should insist upon it that it was "perpetual motion, still." The present patentee may derive a lesson from this anecdote, when his propellers refuse to do their duty.

Two endless chains are to be made of cast iron; the links are to be in the shape of key stones, and are to be hinged together at their narrower ends, so that they will form an arch when their wide ends are uppermost; each of the links may measure about six inches each way. The two endless chains thus formed, are to be passed over a shaft, at the distance of a few feet from each other. Planks are to extend from one chain to the other, mortises being cast in the links for the purpose of receiving them, so that each pair of links has its plank, the whole forming a continued floor.

For a two horse power, the links are to be of the size above mentioned, and will weigh about twelve pounds each, and, according to the drawing, from fifty to sixty of these will form one of the chains. These, with the floor, and the cattle, *or water*, by which it is to be operated upon, will form a load which has to be sustained by the cast iron links, and the wrought iron pins which form the joints, or hinges; and should these pins, or the cast iron, give way, wo to the animals employed.

The inventor says that he expects and claims the right to use this apparatus for propelling boats, and all other kinds of machinery, either by animals walking upon the floor, or by placing upon it buckets like those of an overshot wheel, and moving it by water. He also claims the right of placing one shaft higher than the other. He also claims the right of varying the size of the chains, and of making them of other materials than cast iron.

47. For an improvement in the mode of *Making Beds*, called the spring bed; Josiah French, Ware, Hampshire county, Massachusetts, August 25.

A foundation is to be made by uniting boards together, the length and width of the intended bed. Wire, of about an eighth of an inch in diameter, is to be bent round a cylinder of four inches in diameter, so as to form it into spiral springs of about eighteen inches in length. A frame of the dimensions of the bottom is to be provided, and the springs are to be attached to the bottom, and by their upper ends to this frame. The two are to be drawn together until they are about nine inches apart. On the top of the springs a covering of cotton batten is to be placed, and a covering of duck is to be strained over the frame, covering the cotton batten and the springs. This will also be carried over the sides, and be nailed to the board bottom. Cotton batten, or other soft substance, is to be laid upon the duck, to form the filling of the bed; and when ticking is strained over this, and is nailed to the bottom, the bed is completed.

Until experience convinces us that we err in judgment, we shall rest satisfied with, and, we hope, comfortably on, a good curled hair mattrass, or in winter, if pleasure is preferred to health, a well filled feather bed will continue to satisfy us, and be preferred to iron springs.

48. For a *Kiln for Burning Lime*, with anthracite coal; Joseph M. Downing, Bristol, Bucks county, Pennsylvania, August 25.

This kiln is for the burning of lime by means of anthracite, and the patentee, who has had it in actual operation, states that the lime produced by it is free from coar, and equal for all purposes to the best lime burnt with wood. The kiln is built of stone, with lime mortar, and is lined with fine brick, soap stone, or some similar substance.

The general form of the interior is that of an egg standing vertically, with its top truncated, so as to leave an opening for feeding.

There are no grates, or bars, at the bottom, the lime being allowed to settle down, and is to be withdrawn through an opening left for that purpose.

The stone to be burnt is broken into pieces, the largest of which shall not exceed six inches in diameter. In charging, the larger stones occupy the middle of the kiln. About one-fifth as much coal, broken fine, as there is of stone, is intimately mixed therewith, when both are of the ordinary quality, with this, however, the quantities must be varied.

The claim is to the so constructing the kiln as to dispense with the arch, bars, or grates, to sustain the lime and fuel; and to the general form of the structure.

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49. For an *Instrument to Plumb and Level;* Joseph C. Eldred, Rochester, Monroe county, New York, August 25.

This instrument consists of a rectangular piece of wood, or other substance, which may be two or more feet in length. It may be four inches broad and an inch and a quarter thick. A mortise is to be made through the middle of this piece, the sides of which mortise should be bevelled, to show the spirit levels to be placed within it, of which there are to be two, one at the side, and one at the end. This constitutes the whole instrument, and the patentee very truly informs us that it is "somewhat *similar* to the common spirit level."

The claim is to the instrument as described.

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50. For an improvement in *Bedsteads;* William Gamble, city of Baltimore, August 25.

Instead of a mortise in the posts, where the rail is to enter, a socket containing a female screw is to be firmly inserted. A screw on each end of the rails, fits into the sockets. The rails are round, and the screws upon their ends have shoulders of the same diameter with the rails. These screws turn upon a pin or mandril, which passes through them, and is secured to the rail; the screws can consequently be turned, and screwed into their sockets without turning the rail. The sacking bottom is attached to each of the rails, in a way described, and by turning the rails it may be tightened in any degree. A bolt passing into a hole in the shoulder of the screw, holds it in its place. Instead of the screw, a piece may be fitted into a socket which shall tighten by a slight turn, in a way very similar to some bedstead fastenings now in use.

The claim is to the foregoing arrangement.

The only objection which we see to this improvement, is its expense. The swivelling screw and its appendages, must very considerably enhance the cost of a bedstead, and prevent it from coming into general use. If well made, the apparatus would undoubtedly operate satisfactorily.

51. For improvements in the *Manufacture of Sugars;* Lemuel Wellman Wright, a citizen of the United States, now residing in the city of London, in England, August 25.

There are three objects intended to be accomplished by the arrangements now patented. The first, is an improvement in the evaporating apparatus. The second, the application of a peculiar solvent for the purpose of removing the molasses from the granulated sugar, without injuring the sugar; and the subsequent recovering of a part of this solvent. Thirdly, an apparatus for drying the sugar, and recovering the remainder of the solvent.

In the apparatus for evaporating, four, or more, pans may be used, one only of which need be of the improved construction. This pan, which may be of copper, is to be double, and the space between the two pans is to be two-thirds filled with a strong solution of chloride of calcium, [oxymuriate of lime.] Such a solution may boil at a temperature of about 250 or 260 degrees of Fahrenheit, and will therefore apply a safe and efficient heat to the pan containing the sugar. There is a safety apparatus described and figured, to prevent accidents from the boiling, and a supply apparatus to admit water to keep the solution of chloride at its proper strength. There is also a blowing apparatus, which forces heated air through openings in tubes near the bottom of the boiler, and these, as the contents become concentrated, cause it to be agitated, and to part readily with its remaining water.

The solvent to be used is alcohol, to every gallon of which about half an ounce of strong muriatic acid may be added; this being preferred to the other acids. After the granulated sugar has parted with the larger portion of its molasses by drainage, about a gallon of this solvent is to be inspersed upon every two or three hundred weight of sugar, which will dissolve, and cause a rapid discharge of the impurities. After this, simple alcohol, in the proportion of two or three gallons to a ton, is to be poured on, which will run freely through the sugar, carrying with it the remainder of the impurities. A large proportion of the alcohol may then be recovered for distillation.

The drying apparatus consists of a pan into which the cleansed sugar is to be put. This pan stands upon another containing water, through which convoluted steam pipes pass, and heat the water so as to dry the sugar without injuring it. A cover may be fitted upon the sugar pan to collect and condense the alcohol which will be evaporated from it.

There are many parts to which we have scarcely alluded; the whole, however, are very perfectly represented in the drawings, which, with the specification, exhibit the plan of operating in a very perspicuous manner.

The claim is not to the separate parts, but to that combination and arrangement of the apparatus described, by which the ends proposed are effected.

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52. For improvements in the combination of *Machinery for regulating Heat;* Lemuel Wellman Wright, a citizen of the

United States, now residing in the city of London, England, August 25.

This apparatus is intended to regulate the heat which shall be admitted into hot houses, drying houses, manufactories, dwellings, or any other place where it is required. The principle upon which this regulator acts, is the unequal expansion of metals. If a bar of zinc, and another of steel, are firmly united together throughout their whole length, this compound bar will be curved by any change of temperature. If heated, the greater expansion of the zinc will cause it to form the convex side of the curve, and this convexity will be proportioned to the elevation of the temperature.

Suppose two of these compound bars to be rivetted together by a single rivet in the middle of them, with their zinc sides in contact, these bars will then recede from each other at their ends, by any elevation of temperature; and if these ends be united by joints to the ends of similar bars, their combined action will increase the effect. An apparatus of this kind may be made to open and close a damper, and thus regulate the admission of heat. Several modifications of the instrument are proposed, but all acting on the same principle. We shall hereafter notice a similar arrangement proposed by Dr. Ure.

53. For a machine for *Making Clapboards from Round Logs;* Herald Whittemore, Worcester, Worcester county, Massachusetts, August 26.

On the 26th day of March, 1820, Messrs. Eastman & Jaquith, of Maine, obtained a patent for a machine for the same purpose with the above. Circular saws are used to cut a round log from the outside towards the centre, which, of course, makes the boards feather edged. This machine has been since improved, both by the inventor, and others, and the present patent purports to be a still further improvement. The saw is to consist of four plates of steel, fixed upon the face of a blank wheel; and projecting from it about nine inches; but as they are secured to the wheel by screws passing through slots, their length can be altered. Each exterior end of these four plates has two teeth upon it. From the mode of forming it, it may be called an expanding circular saw.

The apparatus for turning the log, and drawing the carriage back, and its other parts, are described at much length; they are more complex than in the original machine, and we do not perceive any thing about it which should secure it a preference.

The patentee claims as his improvements, the application of blades of steel with teeth to an iron blank wheel; the raising and turning friction rollers; and his particular mode of gearing.

On examining the description of Eastman & Jaquith's machine, published in the fifth volume of Silliman's Journal, it will be found that the principle and general arrangement of the two, are perfectly similar.

54. For an improvement in the *Machine for Manufacturing*

of Shingles; William Thomas, Farmington, Muskingum county, Michigan Territory, August 26.

There have been several editions of this machine, and but for the date, we should think this one of the oldest. A wheel with cutters upon its periphery, is to revolve upon a shaft. It is to be so contrived as to cut the shingles tapering; by what means, however, we are not told. There is no claim made.

There are a number of good machines for making shingles in useful operation; the present, we are convinced, will not be found to interfere with them.

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55. For an improvement in *Rustall's Family Mill,* called the "Vertical Family Mill;" Elijah Skinner, and John Webster, Sandwich, Strafford county, New Hampshire, August 26.

In this mill the two stones are placed vertically, and they are both made to revolve, but in opposite directions. The claim to "improvement, is the revolution of both stones in opposite directions, and the method of feeding through the shaft."

The feeding through the shaft is effected by a screw, or spiral, formed round it, which serves to carry the grain in between the stones, the horizontal position of which renders such a provision necessary. This machine adds another to the list of portable mills, but presents no claim to a preference; that which it makes to novelty, in the running of both stones in opposite directions, has been long since made, and that more than once or twice.

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56. For a *Fly Wheel Press;* David Evans, city of Philadelphia, August 26.

The description of this press does not describe it; and but for the drawing we should know but little of its various parts. It, however, is represented by the pencil of Mr. Wm. Mason, of Philadelphia, in that style of excellence which distinguishes all his labours in this way.

To this press there are two screws, the heads of which rest on its head block, near to its ends. There is a washer, or collar, upon the shanks of the screws below the head block, which serve to support it. The nuts are in the bed piece, or bottom of the press. Upon the head of each screw there is a cog wheel; between, and turning them both, there is a pinion, all, of course, lying horizontally. An axis rises vertically from the middle of the head block, and upon this the pinion turns. Above the pinion, there is a cap which operates as a ratchet wheel, and on the top of this cap there is a horizontal fly wheel. The pinion is to be turned by a lever passing into a socket on the ratchet wheel cap. In pressing, the lever operates upon the pinion through the medium of the ratchet, whilst the lever may be turned back for a new purchase without withdrawing it from the socket.

This is called a fly wheel press, but we are at a loss to discover any real use in this appendage. When the screws are to be brought down to their bearing it offers some advantage, as the motion may then be rapid; but in some other cases, it must be disadvantageous. We see no provision for turning the screws back, and this cannot be done by the lever whilst the rachet is in operation. There are slides in the usual situation of the cheeks, which serve to steady the cap and follower, or platten, in their descent.

The press patented by Charles Evans, of Philadelphia, June 13th, 1831, see last volume p. 346, has two screws, operating as cheeks, and these are specially claimed in a way which appears to embrace the principle of the present patent.

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57. For an improvement in the mode of *Making Bee Hives, and Managing Bees;* Abijah Alley, Cincinnati, Hamilton county, Ohio, August 26.

Each hive, or bee house, is to consist of three compartments, separated from each other by a floor, or partition, furnished with slides, which may be drawn out, or closed, at pleasure. After the bees have filled the upper compartment, the slides are to be closed, and they then work, in the next below, and so on until the whole are filled. The comb and honey may be removed from those compartments which are filled, without destroying the bees.

Hives were constructed in this way at least half a century since, and although the plan may be new to the patentee, it is old to all those who have fully informed themselves respecting the history and mystery of bees.

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58. For a *Hydrostatic Safety Valve* for the boilers of steam engines; Thomas Ewbank, city of New York, August 27.

(The specification was published in the last No.)

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59. For *Cutting Tenons by Revolving Cylinders;* Josiah Fay, Hollis, Hillsborough county, New Hampshire, August 29.

Two cylinders are made to revolve, one above the other, and are capable of being removed nearer together, or further apart. Upon their faces they carry cutters, in the form of plane irons set askew, and from their edges project small spurs, or cutters, which cut the shoulders of the tenons. The piece to be cut lies in the direction of the axes of the cylinders, upon a sliding frame prepared for the purpose.

The machine, as drawn, appears to be unnecessarily complex; an error by no means uncommon in the first formation of instruments of this kind. The patentee claims "the cutting of tenons by revolving cylinders," as his own invention or discovery.

The cylinders have their bearings behind that part upon which the cutters are placed, as these ends must stand out like a chuck in the mandril of a lathe, otherwise the piece to be tenoned could not pass between them.

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60. For a *Machine for filtrating Water and other Liquids;*

James Barron, Esq. of the United States Navy, city of Philadelphia, August 30.

There is to be a tub which is to contain the water or other liquid to be filtered; the bottom of this tub is to be perforated in the centre, a circular hole being cut of any required diameter; into this hole a cylindrical vessel is to be fastened, the top of which will be flush with the bottom of the tub, and is to extend downwards as far as may be required. A grating is to rest upon a rim at the lower end of this cylinder, and another grating, filling the cylinder, is to be fixed on the bottom of an iron screw rod. A bar crosses the top of the tub, and has a female screw in its middle, through which the screw rod works, being turned by a crank at top. Into the cylinder pieces of sponge are to be put, and these by turning the screw rod, will be compressed between the two gratings: this pressure is to be such that water, or other liquid, will just pass through. The quantity of sponge may be varied, as also may the pressure, until that which is found best is obtained.

The claim is to "the before described machine for filtrating water and other liquids through sponge compressed." We apprehend that it would have given greater security, had the patentee claimed the filtering of water through compressed sponge, by means of the foregoing machine, or any other acting upon the same principle, as it certainly would not be difficult to construct a machine, different in its form, and in the arrangement of its parts, in which the same effect should be produced.

61. For a *Washing Machine;* Jesse Barber, Sweden, Monroe county, New York, August 30.

A trough is to be made, the bottom of which is to consist of rounds, placed so as to form the segment of a circle. A frame is to vibrate over these rounds, suspended as in many other patent washing machines; rounds are to be attached to the bottom of this frame to act upon the clothes; so far all is old enough; but the novelty claimed is the allowing half the rounds which form the bed, and half those which form the vibrating segment to roll on pivots at their ends, whilst the others are made fast. The next inventor may leave one-fourth at rest, and allow three-fourths to turn.

62. For a *Churn;* Zuri S. Doty, Bridgewater, Susquehanna county, Pennsylvania, August 31.

This, we are told, "may with propriety be called a self-propelling machine," although a person must be constantly employed to turn a crank. A heavy fly wheel is to run vertically, and upon its shaft there are to be two cranks standing in opposite directions; these are to work two levers, the opposite ends of which act upon the dashers. The churn is of the ordinary vertical kind, but the dasher is divided into two parts, one of which ascends, whilst the other descends.

What there is of novelty in this invention is left to conjecture, there being no claim, and we opine that it possesses but little of this ingredient. We could point to several churns which operate very much like this, but have no time to devote to an inquiry so little likely to be useful.

63. For an improvement in the *Application of the Wheel, Pinion and Crank, or Pulley, to the Screw in Pressing;* Joseph Tickler, Massillon, Stark county, Ohio, August 31.

This is the common screw press, in which a wheel and pinion are used to act upon the screw. There is to be a horizontal shaft upon which a pinion is to be placed; this pinion takes into a horizontal crown wheel at the head of the screw. In the follower there is a nut in which the screw works, and causes it to descend. The shaft carrying the pinion may be turned by a crank, and upon this shaft a whirl, or pulley, is fixed, for the purpose of suspending a weight by a cord from its periphery, where continued pressure is wanted, as in pressing cheese.

There is no claim made, the patentee probably supposing that the application is altogether new. Many presses, however, have been made in which the power of the wheel and pinion has been employed in the working of the screw.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an improvement in the construction of the axles or bearings of rail-way, or other wheeled carriages. Granted to Ross WINANS, *city of Baltimore, July* 20, 1831.

To all whom it may concern, be it known, that I, Ross Winans, have invented an improvement in the construction of the axles, or bearings, of rail-way, or other wheeled carriages, and that the following is a full and exact description thereof.

The axle, with my improved journals, or bearings, may be made straight, and the wheels placed thereon in the usual way; but instead of forming the bearings under the body of the carriage, and within the naves, or hubs, of the wheels, there to sustain the weight of the load, I extend the axles out at each end, projecting beyond the naves to such a length as shall enable me to form them into gudgeons. The lengths and diameters of these gudgeons, I regulate according to the load they are intended to sustain, and to other circumstances. In all cases, however, the value of my invention depends upon the gudgeons having their diameters as small as a due attention to the strength required will allow. The causing the axles to run in boxes, or upon bearings without the naves, admits of their being made much smaller than usual, the degree of diminution which I have found to answer well in practice, will hereafter be stated. They should be formed of good wrought iron, and case-hardened; or overlaid, or cased, with the best steel and hardened, which materially diminishes the extent of bearing surface necessary to enable them to receive and resist the pressure of the load, and their tendency to wear; they may therefore be short, and are consequently strong, when of, comparatively, very small diameter.

The tendency to lateral movement is checked, or limited by forming the end, or point of the axle, or gudgeon, so as to be met occasionally by the external cap, or cover, of the gudgeon box, when lateral pressure occurs.

By placing the bearing outside, (as aforesaid,) the diameter of the wheels may be enlarged with more advantage than formerly, as the axles between the wheels may be made of any required strength, (to resist the increased stress thrown on to that part of them by an enlargement of the wheels,) without affecting the size, or strength, of the bearing journals.

By the foregoing means, the leverage of the wheels, (or the mechanical advantage with which the moving power acts, to overcome the resistance to motion,) is increased, and consequently the friction or resistance to motion in rail-road carriages, diminished to a greater extent than heretofore.

This improvement in the axles and journals of rail-way carriages, was devised and carried into operation on my experimental rail-way, and exhibited to various persons in the early part of the year 1827; and it was put into practical operation, under my direction, on the Baltimore and Ohio, and on the Liverpool and Manchester, rail-roads, in the early part of 1829, in connexion with another improvement for the further diminution of friction, by means of a revolving bearing, or friction wheel, for which other improvement a patent was granted to me on the 11th of October, 1828.

I constructed for use, on the latter of the before mentioned roads, a number of cars with the axles and journals, or gudgeons, of various descriptions and dimensions; the gudgeons, or immediate place of bearing for the load, varied from 1¼ to 2¼ inches in diameter, and from 1¾ to three inches in length. Some of them were made of wrought iron, and case-hardened, and some of iron overlaid with steel and hardened. The axles between the wheels were mostly of wrought iron of from 2½ to three inches in diameter. Several cars, however, were constructed with hollow cylindrical cast iron axles, secured to the wheels by flanches on the ends of the axle, and bolts, the gudgeons being separate pieces firmly fixed into the naves of the wheels. (Wood may also be used for the axle to keep the wheels in their parallel relation to each other, with steeled gudgeons, as aforesaid, to receive the bearings.)

The result of experience by the practical use of those cars for the conveyance of loads from three to six tons, and under various circumstances, is that, (for the support of a given load,) the gudgeons or bearing for the load might, in the manner herein specified, be safely used of from one-third to one-half less in diameter than those in common use, without impairing, but rather increasing, the strength and durability of a car; and the diameter of the wheels finding a less early practical limit, it is evident that a saving in the moving power is effected, as the power acts at a mechanical advantage equivalent to the increased ratio of the diameter of the wheel to that of the axle. These gudgeons, so constructed, were exhibited by me in England, as before stated, and have been adopted there without my deriving any advantage therefrom; as, by the laws of that country, I could not secure the invention by patent, after having publicly exhibited it.

The object of the invention, and a practical demonstration of its utility having been shown, its application and adaptation to the different rail-road carriages, burthen wagons, locomotive engines, &c. and to the different bearing boxes that may be preferred for different purposes, (either revolving, or common,) will be evident, and easy, to any person acquainted with the building of rail-way carriages. But to render it still more so, the following general directions and proportions are given, which I think will be found to be a near approximation to what will be required in practice. When it is intended to convey loads of from two and a half to three and a half tons, and to use wheels of from two and a half to three feet in diameter, the general diameter of the axles may be from two and three-fourths to three inches, and extending through and beyond the naves of the wheels on each side, far enough to go under and conveniently receive the side frame of the load bed, and to have their ends turned, or formed into gudgeons about two and a half to three inches in length, and from one and a half to two inches in diameter. On the four gudgeons thus formed, the carriage body rests by means of any hard metal bearings attached to the before mentioned side pieces; which side pieces are so framed with the cross pieces of the bed as to go on the outside of the wheels, either over or under the gudgeons, as convenience may require. The friction occasioned by the tendency to a lateral movement of the gudgeon is limited by causing the end cover of the bearing to meet the end of the gudgeon as near to the centre of action as possible. When my revolving box is intended to be used, this end is attained by forming the end perfectly square; and when the common box is used, by forming the end of the gudgeons convex or rounding.

In consequence of the small extent of bearing surface embraced by the bearing on the journal, the bearing box, (to guard against wear,) should be made as hard as the use of the most favourable materials for that purpose would permit. The oiling or lubrification of the gudgeons may be effected in any of the usual or convenient ways. But to guard as much as possible against the oil working from the gudgeons on to the rail wheels, it is adviseable to turn one or two small rings, or grooves, on a portion of the axle between the gudgeon and the nave of the wheel, which will obviate that difficulty. I do not intend to be understood as claiming all merely projecting axles with bearing beyond, or external to, the wheels; the single wheel of Sargeant's and of Palmer's rail-way carriage, for single rail-ways, had projecting axles, and several kinds of rail-way carriages have been devised with four wheels, each having separate axles, with both inside and outside bearings, with a view to turning curves with facility. A carriage was made at Liverpool, in England, at a later date than my invention, with outside bearings of the usual size for the purpose of using a broad body, temporarily, and without any view to the object of this improvement, nor effecting the like purpose. My invention is sufficiently distinguished from all others before known and used by the new and useful effect produced in the manner aforesaid.

I therefore declare that the improvement, or improvements, above explained and described, in diminishing the resistance to motion in wheeled carriages to be used on rail-ways, which I claim as my own invention, is the extending the axles each way outside of a pair, or pairs, of wheels, far enough to form external gudgeons to receive the bearing box of the load body, and diminished as aforesaid, with a view to lessen the resistance of friction, as small as its situation, with the use of the most favourable metal for wear, will permit. Thus conveniently increasing the leverage of the wheels, without impairing their effective strength or durability.

ROSS WINANS.

Fig. 1.

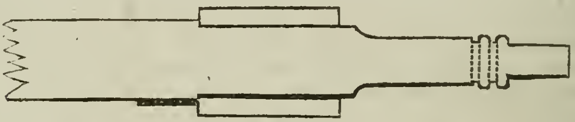

Fig. 2.

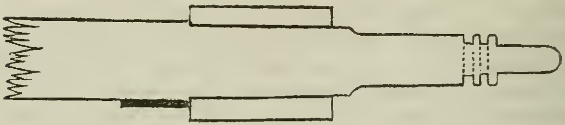

Fig. 1. Axle with flat end.
Fig. 2. Axle with round end.
The dotted lines show the rings or grooves.

Specification of a patent for an improvement in Lamps for the combustion of evaporable fluids. Granted to ISAIAH JENNINGS, *of the city of New York*, *August* 1, 1831.

To all whom it may concern, be it known, that I, Isaiah Jennings, of the city of New York, have invented an improvement in the common lamp, which adapts it especially to the combustion of the combination of alcohol and spirits of turpentine, and of other essential oils and ingredients, for the use of which ingredients letters patent of the United States have been already issued to me, and which improvement in the lamp is also applicable to the combustion of other evaporable ingredients not specified in the letters patent above alluded to. And I do hereby declare that the following is a full and exact description of my said improvement in the lamp.

Instead of a tube, constructed in the ordinary manner, for containing the cotton, or other wick, which is in them allowed to project through the tube, or burner, and lighted at the top thereof, I make a brass, or other tube, which I cause to rise to a much greater height above the reservoir, or body, of the lamp than is usually done, say, for example, to the height of two inches. The upper end of this tube I close entirely, or simply drill a small hole through, of such size as may suit the ingredients to be burnt, but not generally exceeding one-thirtieth of an inch in diameter. Through the sides of the tube, and at about half an inch, more or less, from its lower end, where it joins the body of the lamp, I drill four, or any other number of similar holes.

A tube thus constructed forms the principal feature of my improvement; and in order to use this lamp, I insert a wick of cotton, a bundle of fine wire, or of any other fibrous material which will raise the fluid from the lamp by capillary attraction; allowing the wick to raise to the upper end of the tube, and to descend into the fluid the vapour of which is to be burnt.

When this lamp is to be lighted, all that is necessary is to apply flame to the small openings above described, when the vapour which escapes therefrom will be inflamed, and the heat generated by this inflammation operating upon the tube, will increase the evaporation so as to produce a brilliant light, without the destruction of the wick, or other fibrous substance.

What I claim as new, and as my improvement in this lamp, and which is applicable to such lamps as are now in use, is the tube, or burner, for containing the wick, or other fibrous substance, constructed in the manner, or upon the principles, hereinbefore explained.

ISAIAH JENNINGS.

The first English Steam-boat.

THE following description of the first steam-boat, with the accompanying drawing, is extracted from an interesting little pamphlet just published by Mr. Effingham Wilson, entitled "An Account of the Origin of Steam-boats, in Spain, Great Britain, and America; and of their introduction and employment upon the River Thames, between London and Gravesend, to the present time." In enumerating the early practical philosophers of that sublime agent, steam, we regret that the author of the pamphlet has omitted to include the name of the French engineer, PAPIN. If the writer be not already apprised of this inaccuracy, he will find an account of the man and of his work, in the "*Recueil Industriel,*" No. 54, for last June,* in one of the series of papers upon steam engines, written by Monsieur Arago, who, with some show of justice, claims, on behalf of Pepin, the honour of being the first to apply the agency of steam for the purposes of navigation.

Jonathan Hulls' work was printed in the year 1737, Papin's in 1695—42 years anterior to Hull's. In a subsequent edition of his entertaining and tasteful little book, our author will doubtless refer to the paper we have quoted, and, (if he feel that Monsieur Arago has made out his case,) render justice to the foreigner, on the score of priority of invention. At all events, this is the earliest known drawing of a steam-boat.

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* See vol. iv. of this journal, p. 363.

"The object now to be noticed, is the first steam-boat projected in Great Britain, by Jonathan Hulls, who obtained a patent for his invention, dated the 21st day of December, 1736.

"In the following year he published a tract,* containing a description of his machinery, the title of which is presented to the reader at length, as it contains the interesting fact in the history of steam navigation, that the first attempt was directed to the single purpose of towing ships. 'A description and draught of a new invented Machine, for carrying Vessels or Ships out of, or into, any Harbour, Port, or River, against Wind and Tide, or in a Calm, for which his Majesty has granted Letters Patent, for the sole benefit of the Author, for the space of fourteen years. By Jonathan Hulls. London: Printed for the Author. 1737.'

"From this authentic source the most ample details may be obtained; and in justice to the ingenious inventor, such as it is adviseable to extract shall be given in his own words.

"The author introduces the description of his engine and the boat machinery, with the following general observations:—'Whereas several persons concerned in the navigation have desired some account of my invention for carrying ships out of, and into, harbours, ports, and rivers, when they have not a fair wind. But I could not fully describe this machine without writing a small treatise of the same, in which I shall endeavour to demonstrate the possibility and probability of the matter undertaken. There is one great hardship lies too commonly upon those who propose to advance some new, though useful scheme, for the public benefit. The world abounding more in rash censure, than in a candid and unprejudicial estimation of things, if a person does not answer their expectations in every point, instead of friendly treatment for his good intentions, he too often meets with ridicule and contempt. But I hope this will not be my case, but that they will form a judgment of my present undertaking only from trial. If it should be said that I have filled this tract with things that are foreign to the matter proposed, I answer, there is nothing in it but what is necessary to be understood by those that desire to know the nature of that machine that I now offer to the world, and I hope that, through the blessing of God, it may prove serviceable to my country.' Then follows a long explanation, with definitions and demonstrations of the nature of the powers called into action, for which the reader is referred to the work itself; omitting the full recital here, because it is more desirable to proceed at once to the description of the boat and machinery."

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* This tract has been reprinted by Mr. Partington at the end of his Lectures on the Steam Engine, and it is introduced there with the following note. "This highly curious tract, which the editor has been permitted to copy, throws considerable light on the history of steam navigation. Its great rarity, however, has hitherto prevented its contents becoming generally known to the scientific world, a single copy having been sold for more than *three guineas.*"

Fig. 1.

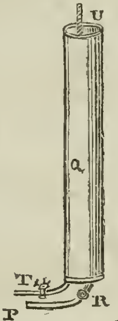
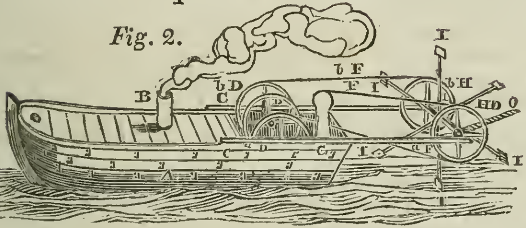


Fig. 2.



Explanation of the wood engraving representing the first Steam-boat projected in England.

Fig. 1.

In some convenient part of the tow-boat there is placed a vessel about two-thirds full of water, with the top close shut. This vessel being kept boiling, rarifies the water into steam; this steam being conveyed through a large pipe into a cylindrical vessel, and there condensed, makes a vacuum, which causes the weight of the atmosphere to press on this vessel, and so presses down a piston that is fitted into this cylindrical vessel, in the same manner as in Mr. Newcomen's engine with which he raises water by fire.

P. A pipe coming from the furnace to the cylinder.

Q. A cylinder.

R. A valve that stops the steam from coming into the cylinder, whilst the steam within the same is condensed.

S. A pipe to convey the condensing water into the cylinder.

T. A cock to let in the condensing water when the cylinder is full of steam, and the valve P is shut.

U. A rope fixed to the piston that slides up and down the cylinder. This rope, U, is the same that goes round the wheel D in the machine.

Fig. 2.

A. The tow-boat.

B. Chimney coming from the furnace.

C, C. Two pieces of timber framed together, to carry the machine.

Da, D, Db. Three wheels on one axis, to receive the ropes F, Fa, Fb.

Ha, Hb. Two wheels on the same axis with the fans I, I, I, I, I, I, which move alternately in such a manner, that when the wheels Da, D, and Db, move backward or forward, they keep the fans in a direct motion.

Fb. A rope going from Hb to Db, that when the wheels Da, D, and Db move forward, moves the wheel Hb forward, which brings the fans forward with it.

Fa. A rope going from the wheel Ha to the wheel Da, that when the wheels Da, D, and Db move forward, the wheel Ha draws the rope F, and raises the weight G, at the same time that the wheel Hb brings the fans forward.

When the weight G is so raised, while the wheels Da, D, and Db, are moving backward, the rope Fa gives way, and the power of the weight G brings the wheel Ha forward, and the fans with it, so that the fans always keep going forward, notwithstanding the wheels Da, D, and Db, move backward and forward as the piston moves up and down the cylinder.

L, L. Teeth for a catch to drop on from the axis, and are so contrived that they catch in an alternate manner, to cause the fans to move always forward, for the wheel Ha, by the power of the weight G, is performing its office, while the other wheel Hb goes back in order to fetch another stroke.

The weight G must contain but half the weight of the pillar of air pressing upon the piston, because the weight G is raised at the same time as the wheel Hb performs its office, so that it is in effect two machines acting alternately by the weight of one pillar of air, of such a diameter as the diameter of the cylinder is!

[*Rep. Pat. Inv.*

Improved Dividing Machine.

The Society of Arts have this month awarded their Gold Isis Medal to Mr. Andrew Ross, for some extremely ingenious and useful improvements in the dividing machine.

The first improvement consists in a new mode of obtaining the divisions for circular dividing engines, depending, in the main, on the same principles as have already been employed, but varying in some of the details. Mr. Ross first divides his circle into forty-eight parts, by continued bi or tri sections, or by a combination of each method. The points thus formed being carefully marked on the limb of the circle, the intervals are then subdivided in the following manner:—An arc, equal to one of the spaces to be subdivided, is procured, and is divided accurately, and to the same degree of minuteness as it is intended to divide the plate of the engine. The radius of this arc is to be equal to that of the engine, and whatever errors there may be in its original divisions, are to be corrected by the following process. A second arc, having an angular value equal to the first, with a radius only one-half or one-fourth as great, is, together with the first, attached and made concentric with the plate of the engine. The divisions of the first are transferred by means of radial lines to the second, the spaces between them being diminished, of course, in proportion to the radii of the respective arcs. When the second arc has received a counterpart of the divisions of the first, it is placed on the circumference of the engine plate, and there fixed, so that the divided arc shall occupy exactly its proper angular space on the limb of the plate. The divisions of the second arc are then transferred to the first or larger one, a single interval on this latter comprising two or four on the former, according as the radius of the one is twice or four times as great as that of the other. In this manner, the errors of any particular intervals become gradually distributed among the rest, and by repeating the process a sufficient number of times are reduced to invisible quantities.

The second branch of Mr. Ross's improvements, consists of the apparatus by which the divisions of the engine plate, corrected as above described, are transferred to the arc of circles of other instruments. This is usually done by means of small teeth, cut on the edge of a large horizontal wheel: these teeth being acted upon by an endless screw, about an inch in diameter. The truth of such an engine depends, first, on a perfect equality between all the teeth in the wheel; and secondly, in an equality in all parts of the spiral formed by the threads of the screw, as well as in the inclination of those threads. The obstacles to perfect success in these particulars arising from slight differences in the density of the metal, or in the sharpness of the cutter, are such as have perhaps never been overcome entirely by the most celebrated artists, however nearly they may have approached it; and the wheel and screw, when once out of the maker's hands, are no longer susceptible of any correction, whatever errors may be discovered.

Mr. Ross's engine consists likewise of two parts, which act as a toothed wheel and endless screw, but so constructed that each tooth of the wheel, and every part of the screw, admit of unlimited correction and adjustment by the person using it. The teeth of the wheel are only forty-eight, and consist of brass cogs into which are tapped steel screws, the axes of which lie in the plane of the wheel, and are at their ends tangents to the circumference. These ends being ground perfectly flat form the virtual faces of the teeth, and capable of being at any time advanced or withdrawn, give, therefore, to the wheel that perfect and constant power of adjustment which has been mentioned. The same power is obtained for the endless screw, by forming it of one deep thin thread, winding round a cylinder four or five inches in diameter. Into this thread are tapped ninety screws, at equal distances, having their axes parallel with the plane of the cylinder: the ends of these screws forming the stops to those in the cogs of the wheel, and like them, are capable of easy and unlimited correction. Thus the circumference of the wheel is divided into 4.320 equal spaces, every one of which may afterwards be corrected if required. [*Mec. Mag.*

Meteorological Observations for December, 1831.

Moon.	Days.	Therm.		Barometer.		Dew point	Wind.		Water fallen in rain.	State of the weather, and Remarks.
		Sun rise.	2 P.M.	Sun rise.	2 P.M.		Direction.	Force.		
				Inches	Inches.				Inches.	
	1	22°	30°	29.70	29.80	16	W.	Calm.		Clear—cloudy.
⊗	2	16	26	30.05	30.05	11	W.	Moderate.		Clear day.
	3	30	32	29.80	29.90	15	W.	Blustering.		Cloudy—clear.
	4	14	28	30.24	30.24	7	NW. SW.	Moderate.		Clear day.
	5	28	36	30.05	30.00	25	SSW.SW.	do.		Cloudy day.
	6	38	45	29.80	29.75	38	SW. W.	do.	.52	Fog—rain.
	7	32	33	30.00	30.10	27	N. NE.	do.		Cloudy day.
	8	29	32	30.05	29.85	32	E. SE.	do.	1.80	Cloudy—rain.
	9	38	42	29.30	29.00	33	W.	Blustering.		Flying clouds—rain.
☽	10	28	42	29.70	29.70	33	W. SW.	Moderate.		White frost: cl'r. overcast
	11	30	33	29.60	29.60	20	W.	Blustering.		Cloudy day.
	12	18	26	29.94	30.00	8	W.	do.		Clear day.
	13	23	48	30.00	30.00	30	SW. SW.	Moderate.		Clear day.
	14	35	49	30.15	30.20	31	W.	do.		Clear day.
	15	34	50	30.24	30.24	32	W.	do.		Clear day.
	16	33	50	30.24	30.20	35	W. NW.	do.		Clear day.
☉	17	30	48	30.15	30.10	37	NE. SE.	Calm.		Cloudy; hazy; rain in n't.
	18	44	56	29.99	29.90	50	SW. SW.	do.	.3	Cloudy; clear; rain in n't.
	19	51	56	29.80	29.83	39	SSW. W.	Blustering.	.1	Flying clouds—clear.
	20	38	46	30.05	30.05	29	W.	Moderate.		Cloudy; cl'r; snow in n't.
	21	32	36	29.85	29.90	30	W.	do.	.21	Cloudy—flying clouds.
	22	20	30	30.20	30.20	13	N.	do.		Clear day.
	23	16	33	30.30	30.20	19	NE. E.	do.		White frost—clear.
☾	24	25	41	30.00	29.90	38	NE.	do.		Clear—cloudy.
	25	36	26	29.63	29.60	26	W.	do.	.81	Rain—snow.
	26	4	8	30.10	30.20	6	W.	do.		Clear day.
	27	—5	8	30.30	30 30	5	W.	do.		Clear day.
	28	2	25	30.30	30.20	12	SW. SW.	do.		Clear—cloudy.
	29	22	31	30.29	30.10	19	NE. S.	do.		Cloudy day.
	30	24	38	29.60	29.60	33	NE. NW.	do.	.60	Rain.
	31	20	32	29.90	29.94	19	W.	do.		Cloudy—clear.
—	Mean	26.07	34.48	29.98	29.95	24.6			3.98	

	Thermometer.	Barometer.
Maximum height during the month,	56. on 18th & 19th.	30.30 on 27th & 28th.
Minimum do. . .	5. below zero on 27th.	29.00 on 9th.
Mean do. . .	30.27 . . .	29.97

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

MARCH, 1832.

On the flow of Water through Tubes.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—The following solutions to some questions proposed to me by Mr. Frederick Graff, Esq. may perhaps prove interesting to some of the readers of the Journal of the Franklin Institute, and are therefore transmitted for publication.

Yours,
James P. Espy.

February 3*d*, 1832.

To Frederick Graff, Esq.

Dear Sir,—The answers to the following questions have been calculated at your request and are given below.

"What quantity of water will be discharged in twenty-four hours by a tunnel five feet clear in diameter, twenty-eight miles long, descending eighteen inches in each mile—starting with a head of twelve inches above the top of the inside of the culvert?"

Also, "What quantity of water will be discharged in twenty-four hours by an iron pipe thirty inches clear in diameter, of the same length, and the same head and fall?"

The first, I find, will discharge 20,649,600 gallons, and the second will discharge 3,650,400 in a day.

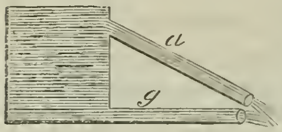
The calculation is made on the supposition that the tubes are perfectly straight and cylindrical, so as to cause no eddies, and permit no air to lodge in the upper parts of bends, which, if permitted, would materially diminish the discharge.

The formula used in the calculation is derived from experiments detailed in the Edinburgh Encyclopædia—art. Hydrodynamics—and may be expressed thus:

Let d be the diameter of the culvert or tube; h, the total head and fall of water, or the height of the water in the reservoir above the middle of the lower end of the pipe; l, the length of the pipe, or tunnel, all in inches; then the velocity in inches per second with which the water will flow in the pipe, will be v.

$v=23\frac{1}{3}\sqrt{\frac{57hd}{l+57d}}$, which in the first case, by calculating, I find to be twenty-three inches and nine-tenths per second; and in the second case $16\frac{9}{10}$ inches.

Now twenty-three inches and nine-tenths per second will give 57,360 yards per day, and as it is known that a cylinder of water one inch in diameter, and ten yards long, is one gallon, it will follow that each yard of the culvert, sixty inches in diameter, contains 360 gallons; but 360 multiplied by 57,360, the number of yards passing through the large tube in a day, gives 20,649,600, as before. In like manner, one yard of a thirty inch tube contains ninety gallons, and the velocity through this pipe of $16\frac{9}{10}$ inches per second, gives 40,560 yards per day, and this multiplied by ninety gives 3,650,400 gallons per day.



You will perceive the calculation is made on the presumption that it is indifferent whether the water be taken out of the bottom of the reservoir, as g, or near the top with a sloping tube, as at a. I see no reason to believe there is any difference, provided there is head enough in the latter case to flow in as fast as it can run through the tube.

By a similar calculation, I find if the sixty inch tunnel, with a similar slope, is only thirteen miles long, the velocity of discharge will be 24.78 inches per second, and will therefore discharge in twenty-four hours 21,330,000 gallons. In like manner it will be found that a tube of twenty inches in diameter, four miles long, with a head and fall of one-hundred feet, will discharge about one-sixth more water than three tubes of twelve inches in diameter of the same length with a similar head and fall.

Yours, respectfully,
J. P. Espy.

Notes of an Observer.—*On the futility of the attempt to communicate mechanical power to a distance through air tubes.*

Dr. Robison, in his third volume of Mechanical Philosophy, gives an account of an attempt made by Dr. Papin to use condensed air as a mechanical power. The failure was complete: I propose to investigate the cause.

He proposed to raise water out of a mine by a water power at the distance of a mile from the mine. He employed the water to drive a piston which should compress the air in a cylinder, communicating by a long pipe with another cylinder at the mouth of the mine. He expected that as soon as the piston at the water power had compressed the air to a certain extent in the tube, it would rush into the cylinder at the mine, force up its piston, and thus work the pump, discharging the water from the mine.

The machine, however, would not work, and as he attributed the failure to the immense quantity of air in the tube, he diminished the diameter of the tube, and arranged his water power so as to exhaust the air, believing that the immense velocity with which air rushes into a vacuum, would make a rapid and effectual communication of power. But he was as entirely disappointed in this arrangement, as he was in the other. Experiments of this kind were made both in Westphalia and Auvergne.

Notwithstanding this failure was complete, an engineer, many years afterwards, "erected a machine, in Wales, at a powerful fall of water, which worked a set of cylinder bellows, the blow-pipe of which was conducted to the distance of a mile and a half, when it was applied to a blast furnace. But although care was taken to make the conducting pipe completely air tight, of great size, and as smooth as possible, it would hardly blow out a candle. The failure was ascribed to the impossibility of making the pipe air tight. But what was surprising, above ten minutes elapsed after the action of the pistons in the bellows before the least wind could be perceived at the end of the pipe; whereas, the engineer expected an interval of six seconds only."

If we take a particular case, and calculate the resistance of air moving through pipes according to acknowledged principles, we shall find that there is nothing mysterious in the above results. It will be found that if the blow-pipe is three inches in diameter, and only a mile long, the air at one end must be kept constantly condensed by a pressure equal to $5\frac{4}{10}$ atmospheres, to produce a velocity of 128 feet per second. And yet this velocity gives only 2,304 gallons per minute, only about half the quantity used in the furnaces of Europe; for, according to Dr. Robison, a blast furnace there expels 720 cubic feet of air per minute.*

If we calculate the velocity of water issuing from a pipe one mile long and three inches in diameter, under a nine feet head and fall, according to the formula given in the preceding article, it will be found to be one foot per second.

Now as equal velocities are generated in all fluids by equal heads, all other circumstances being equal, it will follow that a nine foot head of air, or one eight-hundredth of a head of nine feet of water, will generate in air a velocity of one foot per second in a tube three inches in diameter, and one mile long.

Again, it is known, both from theory and experiment, that the heads of pressure generating velocity in fluids, are as the squares of the velocities. Now the square of one is one, and the square of 128 is 16384, therefore the head of pressure due to the velocity of 128 feet per second, is obtained by the following proportion, as 1 : 16384 : : 9 to 147456, and this number divided by 800 gives $184\frac{1}{3}$, equal to a pressure of $5\frac{4}{10}$ atmospheres, as was said above.

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* Mechanical Philosophy, vol. viii. p. 784.

Now if we suppose this velocity doubled, or 256 feet a second, in order to discharge air enough to supply a blast furnace, the head of pressure will be four times as great, or upwards of twenty-one atmospheres.

This would require a machine equal to a thirty-four hundred and twenty-six horse power, provided a horse can work eight hours a day, and raise one hundred and forty pounds, two hundred feet per minute. Perhaps it may be thought that the great pressure on the inside of the tube will still further increase the resistance; such, however, is not the fact, for it is known that the same quantity of water will be discharged through a curved tube under a given head, whether the curve is vertical or horizontal, thus proving that the increased pressure when the curve is vertical does not increase the resistance. Indeed the diminished velocity which results from increased density in the tube, would indicate, from theory, a diminished resistance.

The precise effect of increased density and diminished velocity, I shall discuss at some future occasion. Enough has been said to show that it is utterly vain to attempt to transmit mechanical power to any great distance through pipes by means of air.

FRANKLIN INSTITUTE.

Reports of the Judges of the Seventh Exhibition of the Franklin Institute.

Report of the Judges on Musical Instruments.

The judges on musical instruments respectfully report, that they have carefully examined the several instruments committed to their notice, and beg leave to present their *unanimous* opinions, as follows:

No. 433. A square piano of three strings, made by Loud & Brothers, merits attention, being in many respects a superior instrument, possessing durability, and brilliancy of tone.

No. 435, is a square piano, made by Loud & Brothers, of superior, but delicate tone, and well calculated for the voice.

No. 471, is a semi-upright piano, made by J. J. Mickley, of excellent workmanship, and of a silvery, soft, and brilliant tone, but too weak.

No. 435, is a square piano, made by —— Geib, of New York, of a bold and powerful tone, and considered a good instrument.

No. 324. A square piano, made by Conrad Myer, possesses some merit, with the middle tones of good quality.

No. 343. A square piano, made by E. N. Scherr, is a good instrument, possessing brilliancy of tone, of good action, and remarkable for the superior finish of the internal mechanism. The fine open tone of this instrument, is, (perhaps,) injured by the useless, but splendid, heavy exterior cabinet work.

No. 345, is a harp guitar, a new invention, made and patented by E. N. Scherr, to whose ingenuity the public is indebted for the production of so good and sweet an instrument, *which well deserves a premium.*

No. 344, is an harmonica, made by E. N. Scherr, that especially deserves commendation; this instrument is well adapted for the parlour or hall, of sweet, yet powerful tone, of most splendid workmanship in each and every particular, and in the opinion of the committee richly *merits a premium.*

No. 384. A flute patented by Mr. Cuddy, made by Firth & Hall, has many excellent qualities; the trumpet mouth is an improvement, possesses a perfect tone, and, in our estimation, is superior to No. 385.

No. 385. A flute made by E. Riley, New York, is of excellent workmanship, and possesses many good qualities.

No. 391. A metronome made and invented by Mr. Maelzell, is a good invention, and has proved, in many instances, to be of much value.

No. 198. The metrotone invented by Mr. Francis H. Smith, is an instrument of ingenious contrivance, capable of describing to a well cultivated ear, *seventy-two distinct sounds in one whole tone.* We consider this invention a useful one, as it will enable Mr. Smith to present to the public his grand harmonica in perfect tune.

No. 197. The grand harmonicon, or musical glasses, patented by Mr. Francis H. Smith, is a pleasing instrument, differing essentially from, and superior to, the musical glasses heretofore brought before the public. The quality of tone is rich, and with its sweetness combines great power. This instrument, we are of opinion, *deserves a medal.*

To the above, we, the judges, do respectfully affix our signatures.

William Norris, Jr.
Abraham Ritter.
J. C. B. Standbridge.

Report of the Judges on Chemicals.

The judges on chemicals report, that they have examined the articles in that department offered for exhibition, and submit the following remarks.

Chemicals from John Elliot, and Wetherill & Brothers—all these articles are of good qualities, and in most cases choice specimens have been selected. The sugar of lead from Wetherill & Brothers, is particularly to be noticed for its beauty.

Pyroligneous acid—M. & S. N. Lewis. This specimen is a concentrated acetic acid of considerable strength and purity. The manufacturers deserve much credit for the perseverance which they have shown in introducing this valuable article, and the perfection in which they now make it.

Purified vegetable oils from J. M. Truman. These oils are very beautiful, that from cotton seeds, in particular, is a new and successful attempt. The committee subjoin a letter from the manufacturers, explaining the qualities, &c. of the oil. They have pressed twelve bushels of the seed, and think it yields from three quarts to a gallon per bushel. They have also a large quantity of the crude oil from the south, which they are now purifying. We understand that at the mill in Richmond two bushels of the seed yield three gallons of oil. The manufacturers here estimate the cost of expressing and purifying the oil to be fifty cents per gallon; so that it will, in all probability, become a very important article of trade.

The spermaceti of Charles Morgan of New Bedford, deserves notice for its extreme whiteness and dryness.

The oils of cantharadin and mustard seed, are said to be solutions in oil of the active principles of those substances separated by ether. The committee have no data from which to judge of their peculiar excellence.

The tonic mixture is a secret medicine, which the committee apprehend does not come within the views of the Institute in getting up this exhibition. If nostrums and secret remedies be admitted, the Institute will find that all who prepare them will seek to place them in the room merely to advertise them more publicly.

Respecting the remaining articles, the judges have nothing to observe.

Daniel B. Smith,
Henry Seybert,
Henry Troth,
Algernon S. Roberts.

Philadelphia, 10 *mo.* 8*th*, 1831.

Letter from Joseph M. & George Truman to the Judges on Chemicals.

Philadelphia, 10 *mo.* 7*th*, 1831.

In regard to the queries respecting cotton seed oil, as to quantity obtained, use, &c., we can inform you that from about three quarts to one gallon of oil can be obtained from a bushel of seed by two expressions, for both of which the seed should be moderately heated, either by means of steam or hot air; the heat from steam, however, is preferable, thereby preventing the danger of burning, which imparts a disagreeable odour, difficult to eradicate. The oil obtained is thick, and of a very dark brown colour, as may be perceived by the sample presented. When submitted to our process of refining, the loss in oil is from ten to twelve per cent., leaving a dark mucilaginous deposit, which, we believe, may be applied to useful purposes, particularly in the manufacture of soap. As the oil from cotton seed is nutritious we see no reason why it may not, on further purification, be used for the table; it has a drying property, but not sufficient for the painter without additional means to make it more so; it does not burn as well as sperm oil; in burning it yields a clear flame, but requires more frequent attention to clean the wick than sperm oil does. We believe it may be used in the woollen manufacture to advantage. It is about equal to olive oil in withstanding the cold of our climate; the refined oil could be sold at one dollar per gallon—there is no deleterious substance used in the process of refining, and when completed no portion whatever of the substances used remains in it.

The sunflower seed oil is obtained, as that from cotton seed, by two expressions; the first cold, for the second the seeds are to be warmed by hot air. About one gallon of oil can be obtained from a bushel of good seed. The oil from the first pressing is much more pure than that from the second, and comes from the press with less colour, but the product of the second pressing becomes equally pure when refined. It is equal for burning to sperm oil, and will not freeze in our climate, and therefore is superior for that purpose to any oil in use; this oil, we believe, will answer for table use, as well as for the woollen manufacture, and for oiling machinery it is superior to olive oil, not corroding brass, &c. The oil would be worth from one dollar to 1 25 per gallon, paying for seed 62½ cents the bushel; it possesses a drying property, and has been used to advantage by a calico printer in preparing certain colours used by them.

In regard to queries respecting the refining of whale oil, we will simply remark, that our process of refining this oil is advantageous in a commercial point of view, being able to do it rapidly and certainly; we refined about 24,000 gallons of this oil during three months of the past summer; the oil is rendered much more pure and pale, and burns with a clear white flame, but requires attention. The process of refining does not alter its character as regards the resistance to the cold of our climate; it is altogether a summer oil. We have on hand about 1,500 gallons of this oil which we will sell at fifty cents per gallon.

Respectfully,

JOSEPH M. & GEORGE TRUMAN.

Report of the Judges on Cabinet Ware.

The judges on cabinet furniture, &c. having carefully examined the different articles submitted to their inspection, respectfully report:—

That the large sideboard deposited by Mr. Charles H. White, is an excellent piece of work, both as to design and usefulness, and although as being a member of the Board of Managers the regulations *forbid* any premium or compliment to himself, we would respectfully recommend the workman who displayed his abilities in making it, as worthy of some token of encouragement.

The wardrobe, loo table, pier tables, arm chairs, and sofa, are all fair specimens of Mr. White's style of work. The lady's dressing table, by Joseph Barry, is a good piece of work, and will bear inspection.

The toilet and lady's work table, by A. G. Quervelle, are handsome articles in his usual good style of workmanship.

The globe work table sent by Michael Bouvier, is a very neat article, and does credit to the workman who made it. Although we cannot commend the design or workmanship of the secretary and bookcase, sent by Mr. Robinson, yet from its being veneered with a fine specimen of our native ash, and having been made by an apprentice, who has not yet been two years at the trade, we recommend him as deserving some encouragement.

We have also examined the hair cloth, and pronounce it a good specimen of American manufacture.

The patent swelled windlass bedstead is also a real improvement, and deserves encouragement. The spring mattrass has been already proved to answer the purpose intended. The scrap table deserves particular notice for the exact arrangement of the figures; and the two japanned tables are also remarkably fine specimens of ornamental work. The three pieces of American oak, cut from the same log, by Mr. Ramage, show the appearance of the surface by being cut in different directions. We think the round table painted to imitate different woods the best specimen we have seen; it deceived some of the best judges.

Jos. B. Barry.
John Jamison,
Adam Ramage.

Philadelphia, October 7, 1831.

Chain Cables.

A question of some considerable moment has been presented to us, respecting the relative goodness of chain cables manufactured in this country, and those made in Wales. It appears that the American made cables are not to be trusted; not because the iron itself is not equally good with the foreign, but because there are some bad links in nearly every chain, that give way when submitted to the test which the imported cables will uniformly bear. It has been said that this is owing to the difference in the mode of making the links; that in Wales they are not touched with the hammer excepting whilst they are at a good red heat, and that they are consequently left in an annealed and tough state. We see some valid objections to this explanation, but whatever be the cause, whether the defect is in the iron master, or in the smith, it ought to be discovered, and the remedy applied. There is too much at stake, when a vessel is dependent for safety upon her cable, to admit of any one employing those in which the fullest confidence cannot be placed. We wish that such as are able would give us their views and experience upon this subject. If the difference under consideration is in the manipulation, and not in the iron, the facts in reference thereto may lead to valuable results in other branches of the iron business, such, for example, as the manufacture of boiler iron, and indeed of all articles where great tenacity is of essential importance.

Editor.

Continuation of the Report of the Committee of the Franklin Institute of Pennsylvania, appointed May, 1829, to ascertain, by experiment, the value of Water as a Moving Power.

(Continued from p. 39.)

TABLE R.

CHUTE NO. 7.—*Undershot. Centre Buckets. Wheel running close to Breast. Bottom of Gate at bottom of Wheel.*

No. of Exper'ts.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Seds.	Feet.	Pds.	Feet.						
1	14.75		14.75	0.75	360	45.69	405.69	41.5	31	12.60	4225	14.75	623187	168361	.267			Air vents open. Water thrown violently through them up to centre of wheel.
2					416	46.59	462.59		36	10.86	4750		700625	191974	.273	.273	10.86	
3					463	47.32	510.32		41	9.54	5500		811250	211782	.261			
4	12.00		12.00	1.00	257	44.06	301.06	41.5	28	13.96	4260	12.00	511200	124940	.244			The frictions for the small weights of experiments, 12, &c. were calculated upon the principles given in pages 78 & 79, vol. viii.
5					360	45.69	405.69		33	11.84	5100		612000	168361	.275			
6					463	47.32	510.32		39	10.02	6225		747000	211782	.284	.284	10.02	
7					519	48.21	567.21		45	8.70	7350		882000	235392	.266			
8					566	48.95	614.95		53	7.38	8350		1020000	255204	.250			
9	8.00		8.00	1.50	257	44.06	301.06	41.5	29	13.48	6700	8.00	536000	124940	.235			
10					360	45.69	405.69		35	11.16	7900		632000	168361	.266	.266	11.16	
11					463	47.32	510.32		52	7.52	10125		810000	211782	.261			
12	2.00		2.00	2.00	20	40.30	60.30	41.5	54	7.24	7060	2.00	141200	25024	.177			
13					48	40.74	88.74		59	6.62	7800		156000	36826	.240			
14					62	40.96	102.96		64	6.10	8200		164000	42727	.260			
15					76	41.18	117.18		66	5.92	8675		173000	51628	.298	.298	5.92	
16					146	42.28	188.28		127	3.08	16525		330000	81123	.245			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE S.—PART I.

CHUTE NO. 7.—*Undershot. Centre Buckets. Wheel running close to breast. Bottom of gate at bottom of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	W't of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	23.00		23.00	1.00	566	45.95	611.95	41.5	20	19.54	4200	23.00	966000	253960	.262			Half the soling taken out, from behind each float board. Wheel worked smoothly; no water dashed over the soling. Three pounds deducted from friction due to weight of wheel; on account of half the soling removed.
2					669	47.58	716.58		23	17.00	4525		1040750	297380	.285			
3					772	49.21	821.21		25	15.64	5050		1161500	340801	.293			
4					875	50.84	925.84		27	14.46	5675		1315250	384223	.294	.294	14.46	
5					978	52.47	1030.47		32	12.20	6550		1506500	427644	.284			
6	20.75		20.75	0.75	360	42.69	402.69	41.5	23	17.00	3300	20.75	684750	167116	.243			
7					463	44.32	507.32		29	13.46	3850		798975	210537	.275	.275	13.46	
8					566	45.95	611.95		36	10.86	4750		985625	253960	.257			
9					669	47.58	716.58		43	9.09	5800		1203500	297380	.247			
10	20.75		20.75	1.00	566	45.95	611.95	41.5	22	17.76	4450	20.75	923375	253960	.274			
11					669	47.58	716.58		24	16.28	4850		1006375	297380	.295	.295	16.28	
12					772	49.21	821.21		31	12.60	5675		1177560	340801	.280			
13	17.75		17.75	0.75	257	41.06	298.06	41.5	26	15.00	3050	17.75	541375	123695	.228			
14					360	42.69	402.69		29	13.48	3675		652312	167116	.287	.287	13.48	
15					416	43.59	459.59		31	12.60	4050		718875	190730	.265			
16					463	44.32	507.32		36	10.86	4675		829812	210537	.253			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE S.—PART II.

CHUTE NO. 7.—*Undershot. Centre Buckets. Wheel running close to Breast. Bottom of Gate at bottom of Wheel.*

No. of Exper't.	Head of Water above. Btm. of gate.	Head of Water above. Top of Bkt.	Head of Water above. Btm. of Bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
17	17.75		17.75	1.00	430	43.81	473.81	41.5	23	17.00	4225	17.75	749930	196631	.262			
18					463	44.32	507.32		24	16.28	4300		763250	210537	.276			
19					566	45.95	611.95		27	14.46	4900		870750	253960	.292	.292	14.46	
20					669	47.58	716.58		33	11.84	5775		1024812	297230	.290			
21					772	49.21	821.21		40	9.77	7000		1242500	340801	.282			
22	4.67		4.67	1.75	146	39.28	185.28	41.5	42	9.30	7000	4.67	326900	76891	.235			
23					202	40.16	242.16		48	8.14	8200		382940	100496	.262			
24	4.67		4.67	2.00	146	39.28	185.28	41.5	39	10.02	7430	4.67	346981	76891	.221			
25					202	40.16	242.16		45	8.70	8450		394615	100496	.253			
26					230	40.60	270.60		47	8.32	9000		420300	112299	.266			
27					257	41.06	298.06		51	7.66	9850		459995	123705	.268	.268	7.66	
28	4.67		4.67	2.25	257	41.06	298.06	41.5	48	8.14	9900	4.67	462330	123705	.266			
29					285	41.50	326.50		50	7.82	10425		486847	135497	.277			
30					299	41.72	340.72		52	7.51	10775		503192	141398	.279			
31					313	41.94	354.94		54	7.23	11075		517102	147300	.283	.283	7.23	
32					341	42.38	383.38		57	6.85	12650		590755	159102	.267			
33	2.00		2.00	2.50	76	38.18	114.18	41.5	64	6.10	9700	2.00	194000	47373	.247			
34					90	38.38	128.38		69	5.66	10600		212000	53277	.253			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE T.—PART I.

CHUTE NO. 7.—*Undershot. Wheel removed from Breast. Bottom of Gate at bottom of Wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pds.	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	20.75		20.75	1.00	669	47.58	716.58	41.5	26	15.00	4925	20.75	1021937	297379	.290			
2					725	48.45	773.45		27	14.46	5325		1104937	320981	.290			
3					772	49.21	821.21		28	13.96	5560		1153700	340801	.296	.296	13.96	
4					800	49.65	849.65		29	13.46	5760		1195200	352604	.293			
5					828	50.09	878.09		31	12.60	6000		1245000	364407	.292			
6					875	50.84	925.84		34	11.50	6550		1359125	384223	.282			
7	20.75		20.75	1.25	875	50.84	925.84	41.5	25	15.64	6155	20.75	1277062	384223	.300	.300	15.64	
8					978	52.47	1030.47		29	13.46	7025		1457687	427644	.291			
9					1081	54.10	1135.10		33	11.84	7925		1644437	471065	.287			
10	4.67		4.67	1.75	202	40.16	242.16	41.5	48	8.14	8075	4.67	377100	100496	.266			
11					230	40.60	270.60		51	7.66	8800		410960	112299	.276	.276	7.66	
12					244	40.82	284.82		58	6.73	9775		456492	117200	.258			
13	4.67		4.67	2.50	285	41.50	326.50	41.5	47	8.32	10800	4.67	504360	135497	.266			
14					313	41.94	354.94		50	7.82	11500		537050	147300	.274			
15					341	42.38	383.38		51	7.66	11775		549892	159102	.290			
16					360	42.69	402.69		54	7.23	12200		569240	167116	.293			
17					374	42.91	416.91		56	6.98	12800		597760	183017	.305	.305	6.98	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE T.—PART II.

CHUTE NO. 7.—*Undershot. Wheel removed from Breast. Bottom of Gate at bottom of Wheel.*

No. of Exper't.	Head of water above. Btm. of gate.	Head of water above. Top of bkt.	Head of water above. Btm. of bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
18	3.00		3.00	2.00	76	38.18	114.18	41.5	48	8.14	7300	3.00	219000	47373	.216			
19					146	39.28	185.28		62	6.30	9300		279000	76891	.275			
20					160	39.50	199.50		65	6.01	9920		297600	82792	.277	.277	6.01	
21					188	39.90	227.90		81	4.82	12000		360000	94578	.262			
22	3.00		3.00	2.50	146	39.28	185.28	41.5	55	7.10	10375	3.00	311250	76891	.247			
23					160	39.50	199.50		56	6.98	10600		318000	82792	.264			
24					188	39.90	227.90		60	6.51	11575		347250	94578	.272	.272	6.51	
25					202	40.16	242.16		65	6.01	12425		372750	100596	.269			
26	2.00		2.00	2.00	76	38.18	114.18	41.5	69	5.66	8400	2.00	168000	47373	.281			
27					79	38.23	117.23		72	5.43	8710		174200	48650	.279			
28	1.00		1.00	1.50	20	37.30	57.30	41.5	131	2.98	10625	1.00	106250	23779	.232			
29			1.00	1.75	20	37.30	57.30	41.5	105	3.72	10110	1.00	101110	23779	.241			
30			1.00	2.00	20	37.30	57.30	41.5	91	4.29	10400	1.00	104000	23779	.238			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

FRANKLIN INSTITUTE.

Minutes of the Board of Managers.

A MEETING of the Board of Managers of the Franklin Institute, was held at the Hall of the Institute, January 26, 1832.

JAMES RONALDSON, President, in the chair.

So much of the minutes of the Institute as related to the election of this Board, was read by the Actuary, when, on motion, the Board went into an election for a chairman for the ensuing year. Messrs. Thomas Fletcher and Isaac B. Garrigues, were appointed tellers, who received the votes of the members, and reported the result to the president, who declared WM. H. KEATING, Esq. duly elected chairman.

Mr. Keating made an appropriate address, and took his seat as presiding officer, when the Board continued the election for Curators for the ensuing year; the same tellers were continued, the following gentlemen were duly elected curators—SAMUEL J. ROBBINS, ISAAC HAYS, M. D.

The regulations adopted by the former Board were read, and after some amendments were adopted for the government of this Board.

On motion, the committees appointed by the late Board to try experiments on water wheels, and to inquire into the cause of the explosions of the boilers of steam engines, were continued.

A stated meeting of the Board of Managers was held at the Hall of the Institute, February 9, 1832.

WM. H. KEATING, presiding.

The minutes of the last meeting were read and approved.

The chairman nominated the several standing committees agreeably to the regulations, when, on motion, the names of Messrs. Christian Gobrecht and W. R. Johnson, were added to the committee on inventions—Mr. Wm. H. Keating to the committee on premiums and exhibitions; and Mr. Jacob Pierce to the committee on minerals. The committees were then constituted as follows, viz.

On Premiums and Exhibitions.

S. J. Robbins,
Frederick Fraley,
M. W. Baldwin,
Joshua G. Harker,
Alexander Ferguson,
J. Henry Bulkley,
Isaiah Lukens,
Wm. Wetherill,
Wm. H. Keating.

On Inventions.

Samuel V. Merrick,
Benjamin Reeves,
Alexander Dallas Bache,
James Ronaldson,
Isaiah Lukens,
M. W. Baldwin,
Rufus Tyler,
John Agnew,
Christian Gobrecht,
W. R. Johnson.

On the Library.

M. D. Lewis,
Isaac Hays,
Alexander Ferguson,
Wm. B. Reed,
John B. Trevor.

On Publications.

Isaac Hays,
Samuel V. Merrick,
Alexander Dallas Bache,
M. W. Baldwin,
Charles Toppan.

On Instruction.

Alexander Dallas Bache,
Charles H. White,
Frederick Fraley,
Samuel J. Robbins,
John Weigand.

On the Cabinet of Minerals.

Isaiah Lukens,
William Wetherill,
Abraham Miller,
Thomas Scattergood,
George W. Tryon,
Jacob Pierce.

On the Cabinet of Models.

Frederick Fraley,
Rufus Tyler,
John Agnew,
Isaac B. Garrigues,
Charles H. White.

Managers of the Sinking Fund.

Samuel V. Merrick,
John B. Trevor,
John Struthers.

Auditors.

Mordecai D. Lewis,
Isaac B. Garrigues.

The candidates proposed at the last meeting were duly elected members of the Institute.

Several candidates for membership were proposed, and laid over until the next meeting, agreeably to the by-laws.

Extract from minutes.

William H. Keating, *Chairman.*

William Hamilton, *Actuary.*

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN SEPTEMBER, 1831.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in the *Marine Rail-way,* for the purpose of hauling vessels out of the water; John G. Colley, Shipwright, Norfolk, Virginia, September 1.

This rail-way is the well known Moreton's rail-way, which forms an inclined plane, upon which vessels are to be hauled up. The improvement consists in having a tongue project up from the centre of the iron plate with which the rails are faced, and in having grooves in the middle of the rollers into which the tongues enter, and serve as guides. The cradle upon which the vessel is received has similar plates and tongues on its lower side, which work into the grooves on the upper sides of the said rollers.

The foregoing is the whole substance of the specification; no claim is made, but it is plain that the tongued plates, and grooved rollers, are considered as constituting the invention.

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2. For an improvement in the *Machine for Shelling and Cleaning Corn;* Jesse Reed, Marshfield, Plymouth county, Massachusetts, September 1.

A cylinder of wood, about ten inches in length, and six in diameter, is to be set with spikes. This cylinder has a pinion on one of its axles into which meshes a cog wheel, turned by a crank. The ears of corn are borne up laterally against the cylinder by which they are shelled; wires are so placed in the cheek which bears against the corn as to give it a progressive motion. The bottom is formed of wire grating, which allows the chaff, but not the corn, to pass through; this latter, with the cob, falls down a trough at the end of the machine.

The claims are to the horizontal cylinder; the pitch of the bed piece on which the ear rests; the grates for conducting and cleaning the corn; the wires on the arm which regulate the ear; and the enclosing the machine so as to prevent the scattering of the corn.

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3. For an improvement in the *Scraper for the removal of earth;* denominated the "excavating scraper," Dudley Marvin, Canandaigua, Ontario county, New York, September 2.

(See specification.)

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4. For an *Apparatus for excavating and removing Earth,* denominated the "inclined plane excavator;" Dudley Marvin, Canandaigua, Ontario county, New York, September 2.

(See specification.)

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5. For an instrument for determining the points in *Marking and Cutting Garments,* called the "American System;" John Pudney, Waterford, Saratoga county, New York, September 3.

Mr. Pudney's AMERICAN SYSTEM consists of a square like that of a carpenter, formed of wood or metal, one of the arms being about two feet in length, and the other about six inches. A segment of a circle unites the long and short arms, the angle of the square being its centre; a tongue, or secondary arm, works upon a joint at this centre, and opens like a rule. There are divisions, with letters and figures on the circular segment, and others on the arms, which serve as a scale to mark the points for cutting garments.

The claim is to the before described instrument.

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6. For an improved *Scraper and Harrow*, to be used in the

cultivation of Cotton; William P. Sample, Bedford county, Tennessee, September 3.

The frame work of this instrument resembles that of the well known triangular harrow, or cultivator. The patentee states that other scrapers have been made which nearly resemble his, but that their frame work was so constructed as to cause the horse employed to draw them, to trample upon the cotton, whilst by his construction, the animal is removed a foot from the rows. Scrapers, in the form of a V, are fixed upon helves so as to work upon each side of the row of cotton; these scrapers are so formed as to cut the surface, and cover low grass and weeds with earth. It is said that in consequence two scrapers being fixed on the same instrument, it executes double the work of any other. The patentee, however, relies principally on the form of the wooden part, as sustaining his claim to novelty.

7. For a *Machine for digging Ditches and excavating Canals;* William Graham, New Orleans, Louisiana, September 5.

A wheel, made somewhat like the bucket wheel of a water mill, is to perform the excavating, for which purpose the buckets, or arms, are to have their edges armed with steel cutters.

This excavating machine is to be driven by horse or steam power, through the medium of a crank, and a train of wheel work. A frame is to be made of sufficient strength to support the whole apparatus, which is to be fixed upon wheels, and moved forward by the same power that drives the excavating wheel, which wheel is fixed upon a shaft supported by the carriage frame. A steam engine may be employed to drive a pinion on a crank shaft, which, taking into a spur wheel on the shaft of the excavator, will give it the required motion. To cause the carriage to advance as the excavation proceeds, two of the oarriage wheels are to be turned by means of endless screws, driven by bevel gear from the shaft of the excavating wheel.

The earth removed by the cutters, is to be carried up by the arms or buckets, until it arrives at its greatest elevation, but when it has passed a line perpendicular to the centre of the wheel's motion, it is to be forcibly thrown off on to a sloping roof fixed for that purpose. In beginning to work with it, an excavation must be made in the ground to receive the operating wheel.

The patentee says that with an engine of eight horse power, this machine will perform the labour of three hundred hands.

If the inventor has actually tried his machine and fully tested its utility, his experience is worth infinitely more than all our speculations. Should it have answered its intention on the Planquemine canal, or on other ground in the vicinity of New Orleans, where there are neither stones or roots, that is all which can be expected from it, and would suffice to establish its character for use in similar situations. In the absence of all evidence upon the subject, we, however, are apprehensive that the throwing off the dirt at the proper time, and the causing it to arrive upon the sloping roof, down which it is to fall, will be attended by some difficulty.

8. For an improvement in the mode of *Manufacturing coarse Salt from salt water;* Aaron Barnes, Deerfield, Oneida county, New York, September 7.

A boiler of iron or copper, which is to be the frustrum of a cone, is to be fixed horizontally. This boiler may be twenty-two feet in length, three feet in diameter at the larger, and two feet six inches at the smaller end. It is to be surrounded by a flue, a furnace being placed in front of it, that is, at the smaller end; the heat from the furnace is carried under the boiler, and returned back above it to a chimney at the front. The boiler is to be supplied with salt water through a tube, which reaches nearly to its bottom, conducting the cold water into the most heated part at the front. The back end of the boiler opens into a *boiling vat*, which may be a wooden vessel, twelve feet square, and five deep. This vat is to be closely covered to prevent the escape of steam. A *settling vat* forty feet long, twelve wide, and two deep, is placed below the boiling vat, so that the concentrated salt water may be drawn off from the latter into the former. A salting, or *crystallizing vat*, 140 feet long, twelve wide, and one deep, may receive the brine from the settling vat.

Tubes from the boiling vat convey off all the steam generated and carry it under the settling and salting vats. These tubes, widened out, make a part of the bottoms of the vats, and thus convey the heat of the steam to the brine. When additional heat is required other similar tubes from independent boilers may be employed to supply it.

By this arrangement, coarse salt, it is said, is rapidly formed in the salting vat, and both labour and fuel saved.

The claim is to the arrangement of the utensils, and their application to the purposes, and in the manner, specified.

9. For an improvement in the *Material, or manufacture, of the Surgical Instrument called the Pessary;* Joseph Warrington and William Scattergood, Northern Liberties, Philadelphia county, Pennsylvania, September 5.

The material to be employed is glass, which from its power of resisting corrosion, is not acted upon by those secretions to which the instrument is subjected when in use. The pessary is to be made in all the variety of forms which may be required, and is in general to be blown hollow, to insure the requisite lightness.

10. For an improvement in the *Machine for Breaking Hemp;* William Stone, jr., Williamson county, Tennessee, September 8.

This is the old fashioned Dutch break; but the patentee says that he makes an additional set of teeth across the jaws of the break. The upper jaw is to be raised by cams, or lifters, upon a shaft, and the teeth, as well as the whole machine, we are told, may be made larger or smaller.

The patentee claims the mode of applying the power, as well as the additional teeth. We do not perceive what there is new in the mode of applying the power; the additional teeth, may, possibly, add something to its utility.

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11. For *Making Rope and Cordage of all kinds, by machinery;* William Stone, jr. Williamson county, Tennessee, September 8.

By means of the machinery described in the specification, the hemp, or other material, is to be converted into laid rope, by a continued operation. We shall not attempt to describe the apparatus employed, as this would be of little avail without drawings; nor do we think it necessary, as several patents have been obtained in this country for machines operating upon the same principle, and similar machines are in use in England. The principal object proposed is the twisting and laying at one operation, and the patentee says that this may be effected by means of his machinery, not only on small cordage, but also on the largest ships' cables. That he can thus manufacture cordage and ropes of a moderate size, we are well aware; but large ships' cables would prove to be untractable affairs to twist about and whirl round in the manner required.

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12. For a *Washing Machine;* Wilson Gregory, city of Richmond, Virginia, September 9.

This is a rectangular box, with gudgeons on two of its ends, and a crank by which it may be made to revolve. On one side is an opening, and a closely fitting door, and at each of the four longitudinal angles within the box are fixed four rollers, which give its interior an octagonal form.

The claim is to the foregoing machine, and particularly to the rollers, to prevent the clothes being injured by friction.

Will not some ingenious *inventor* add a roller at each angle, and then take out a patent for his improvement?

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13. For an improvement in the *Bee Hive and the art of managing Bees;* Eben Britton, Littlefalls, Herkimer county, New York, September 9.

We do not think it necessary to enter into a detailed description of the construction of this hive, or of the particular manner of using it. It consists generally of three boxes, which may be placed one upon the other. Each of these is divided into two compartments, and they are furnished with slides which open and close apertures leading from one box, or compartment, to another, the object of which is so to manage the bees that the contents of the upper box, and of smaller boxes, which are occasionally applied, may be obtained without disturbing the bees.

The patentee appears to think the whole arrangement new, as he claims "the entire art of managing bees as herein described; together with the bee hive and its component parts, as constructed; excepting only the small boxes placed at the top of the first or uppermost box, the four cross sticks in the main part of each box, and the mouth or orifice in front of the same."

Boxes have been repeatedly placed upon each other, and sliding pieces have been applied to open and close the communication between the various compartments of hives so constructed, and, of course, a management of the bees very similar to that of the present patentee has been adopted. In the last number at p. 133, we had occasion to notice an arrangement of hives very similar to the present in its general principle.

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14. For an improvement in *House, Ship, and Camp Furniture;* Edward Clibborn, Cincinnati, Hamilton county, Ohio, September 12.

An extended description is given of the various applications of this improvement to bedsteads, cots, lounges, easy chairs, and various similar articles, and this is accompanied by forty-four drawings, or sketches, intended to illustrate these applications. The object proposed is to obtain greater elasticity than ordinary in the bottoms of such furniture. For this purpose oval frames are to be made of hickory, ash, whalebone, iron, steel, or any other elastic substance. These frames form elastic hoops which may be joined together by rivets, bands, hinges, or otherwise. Over these frames, ticking, netting, or other material is to be stretched and secured to the hoop. The threads, if cloth is used, are to extend obliquely, or biasing, and it is not to be strained so as to destroy the elastic action of the hoop or frame.

Cots, or bedsteads for invalids, may have hinges placed upon the upper or lower sides of the oval frame, to allow the bottoms to be elevated or depressed in the manner of such as have been used in hospitals and elsewhere.

The patentee calls the furniture, so made, *atmospheric furniture,* because persons reclining on bottoms of this description may be exposed to the action of air on every side.

There is no particular claim made, but the general nature of the thing intended to be patented is made sufficiently obvious.

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15. For an improvement in the mode of *Raising Ships, or other Vessels, Canal or Steam-boats, Sloops, Schooners, &c.,* weighing anchors, discharging cargoes, hoisting goods in stores, raising and removing buildings, and all kinds of heavy burthens, and used as a compressing machine, known and distinguished by the name of the "Elevating Power Engine and Compressing machine;" Benjamin Bruff, Rochester, Monroe county, New York, September 13.

In addition to the purposes named in the above title, to which, it is said, this machine may be applied, there is afterwards added the raising of mineral coal, and *weights to propel boats or mills.*

The machine consists of three or more levers of the first kind; these levers are to be fixed in a frame, side by side, as they are to operate simultaneously. When used for raising ships or other vessels, the extreme ends of the levers are to be passed under the vessel, or they may pass over the deck; in which case, iron chains or braces are to pass from them round the keel. When the vessel is thus secured, a double windlass, situated below the longer ends of the levers, is used to draw them down, and raise the vessel.

The levers, we are told, may be about forty feet long, and, as shown in the drawing, the fulcrum is about one-fourth of that length from the boat; to raise a vessel five feet, the other end of the lever must, therefore, be depressed fifteen. What then must be the length of a lever to raise a ship? It is really strange that any one should expect to accomplish such a purpose by means so totally inadequate; but the climax is capped by the proposition to raise weights to propel boats or mills; the absurdity of the original design is scarcely to be noticed alongside of this new intention.

Another gentleman of Rochester, Mr. William W. Smith, obtained a patent for a machine altogether similar, excepting that the levers were to be drawn down by screws, instead of by a windlass and rope; the specification of this patent may be found at p. 301, vol. v. with some remarks of ours respecting it.

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16. For an improvement in the mode of manufacturing *Steel Forks*, called " Goodyear's Steel Forks;" Charles Goodyear, city of Philadelphia, September 7.

The patentee proposes to make steel pronged forks, with iron shanks, without splitting the steel in forming the prongs. Steel is to be taken of proper size for forming the prongs; and for a two pronged fork this is to be laid upon an iron bar, about two inches from its ends, the steel at right angles with the iron, and extending each way far enough to form a prong. The end of the iron bar is then to be bent over, and cut off even with the short piece. After forming the prongs by pointing and bending, the iron is to be welded and drawn out to form the shank.

When there are to be three or four prongs, the process is to be so managed as to admit of their formation on the same principle.

The fork, when completed, is to be dipped in melted tin, until it is coated with that metal.

The claim is to the manner of putting the materials together, without splitting the steel bars, and to the tinning of the forks.

The blacksmith must judge respecting the novelty in the proposed manner of making forks, as upon this depends the validity of the claim. For ourselves, we should have supposed that any intelligent workman who happened to have a steel rod the right size for prongs, would readily resort to such a mode of using it, without exhibiting any more of invention than is daily called for in the pursuit of his business.

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17. For an *Anthracite Cooking Stove;* Walter Bryent, Boston, Massachusetts, September 13.

The stove is to be made of cast iron, and the anthracite is to be burnt in a grate of the ordinary construction, but besides the front bars, the grate is also to have perpendicular bars at the back to admit of a draft through the fire to, and round, an oven, which stands behind the grate. Dampers are to be provided to regulate the draft; a boiler is to be placed directly above the fire, and a larger one above the oven; tubes from these boilers are to conduct the steam into another tube leading directly under the furnace, that it may pass into the fire.

The parts considered as new are not designated, no claim being made; there is a drawing, but it is without written references.

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18. For an improvement in the *Water Wheel, and the application of Water thereto;* Joel Eastman, Bath, Grafton county, New Hampshire, September 28.

(See specification.)

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19. For *Manufacturing Shovels, or Scoops, from sheet iron, copper, zinc, or any other metal;* Mordecai Bull, Greenwich, Washington county, New York, September 28.

A cast iron bed piece, of the proper form, with a follower to fit into it, and which is to be forced down by means of a lever, constitute the apparatus used. The sheet metal is to be forced between the follower and bed, into the required shape.

This kind of machinery is too well known to be the subject of a patent, it must therefore be intended to claim the applying it to the manufacturing of the particular articles in question, a claim of very doubtful validity.

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20. For a *Thrashing Machine*; Thomas Carpenter, Elmira, Tioga county, New York, September 28.

Instead of the cylinder usually employed, a wheel of pine boards is to be made of about five feet and a half in diameter. This is to be strengthened on one side by a rim of oak; on the opposite side are to be fixed strips of wood, armed with iron, which constitute the beaters, of which there may be sixteen or eighteen, radiating like the spokes of a wheel. The wheel thus prepared is to be fixed vertically in a frame, like a grindstone, and between it and a facing fixed to the frame the thrashing is to be effected. The facing, which answers the purpose of the ordinary segment, is to be made into ridges, and to have strips of iron to strengthen and defend it. A band and whirl may be used to give motion to the wheel.

The patentee says, "What I claim as my improvement in the thrashing machine is, that a wheel of this size and form requires only about five hundred revolutions in a minute, and will make as good work and as expeditious as the cylinder machines that require from fourteen to sixteen hundred." This certainly is not a very felicitous manner of presenting the claim.

21. For a *Thrashing Machine;* Ezra Wickwire, Alexander, Gennessee county, New York, September 28.

The cylinder of this machine is the only part claimed, and upon what ground it would be no easy task to tell; there are no precise directions given respecting it, but, on the contrary, a general latitude of construction is proposed, embracing several old and well known plans. The cylinder may be of wood or of iron, either cast or wrought, the beaters may run either straight or diagonally, and their number may vary as you please. The concave may be placed either above or below, and may be made like the cylinder, or as you like it.

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22. For a *Shingle Machine;* Cheney Reed, Worcester, Worcester county, Massachusetts, September 28.

A cast iron wheel is to be made to revolve horizontally in a suitable frame; a knife, or shave, which is in segments, forms a circular cutter on the under side of this wheel. There are to be two circular platforms which also revolve upon vertical shafts underneath the cutter wheel, one on each side of its shaft, their peripheries approaching each other as nearly as the shaft of the cutter wheel will allow. Upon the upper surfaces of these platforms are pieces which serve to gripe the shingles to be shaved; the bed upon which the split or sawed shingle lies has a sufficient inclination to give to it a thick and thin end. The dressing on one side is effected on one of the platforms, and the shingle is then removed to the other platform, which finishes the other face, each of these platforms carrying the shingle under the revolving cutter. From the upper side of the cutter wheel project out four knives, or clearers, which serve to cut and remove the shaving, as this, from its width, might otherwise obstruct or choke the machine.

The claim is to the circular rotary shave, and the circular rotary carriages, or platforms.

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23. For a *Spring Door Catch;* James Buck, Bucksport, Hancock county, Maine, September 28.

This is a very simple contrivance, consisting of a bolt, spring, and knob, or knobs. The bolt is to be let into the edge of the door by boring a hole of sufficient depth. A straight spring, let into the edge of the door under the bolt, and covered by a plate, forces the catch forward. Knobs, or handles, like those upon the spring bolt of a lock, turn in the usual manner, a projection, or pallet, upon the shank serving to push the catch back.

There is no claim made, and no further room for one than is furnished by a trifling variation of form from such bolts and catches as have been in common use.

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24. For a *Churn;* James Van Auken 2nd, Knox, Albany county, New York, September 28.

An upright churn has within it two vertical shafts which are made to revolve and carry dashers; there is a cog wheel taking into pinions on the top of the two vertical shafts, and by turning a crank these are set in motion.

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25. For a *Suction and Lifting Pump;* Elisha Tolles, Litchfield, Litchfield county, Connecticut, September 28.

This patent is taken for the particular arrangement of the different parts of this pump without a claim to any thing new in its principle. The tubes, chamber, and other parts, are to be of metal. The chamber is to be low down in the well, and the piston rod is to descend through a tube which operates as an air vessel, the rod working through a stuffing box at the top of it. A rising main, or delivery pipe, extends up, entering the side of the chamber at its upper part. The piston is to be of metal, with a leather stuffing. The mode of making it is particularly described, but we do not perceive in it any thing rendering it superior to some others already in use.

One object in placing the chamber low down is to avoid danger from frost; the water, however, in the rising main is as much exposed as usual.

Although called a suction and lifting pump, it is, in fact, a forcing pump.

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26. For an improvement on the mode of *Applying Rollers for the reduction of friction in axles*, &c., as first patented January 27, 1830; Isaac Cooper, Baltimore, Maryland, September 28.

This is a modification of Garnett's friction rollers. Upon the end of the axle of a rail-road car, a plain metallic ring is to be placed. Friction rollers which revolve on their axes surround this ring, exactly as they surround a gudgeon on Garnett's plan, as this ring is in reality nothing more than an enlargement of the gudgeons. The outer peripheries of these rollers press against a semicircular metallic arch upon the frame of the car. The claim is to this arrangement.

This, in principle, is essentially the same as Garnett's rollers, although presented under an arrangement somewhat different from his, but not, as we perceive, affording any advantage over the old form.

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27. For an improvement in the *Application of the Power of Wind to Mills,* Factories, Boats, or Vessels, Pumps, and all kinds of Machinery; John Y. Van Tuyl, Rahway, Essex county, New Jersey, September 28.

This wind wheel is to revolve horizontally, being sustained and balanced on a shaft passing up through its centre into a cavity on the upper side of it. Its periphery is surrounded with buckets something like those of a water wheel, but pointing, as radii, to the centre. The wind is to be made to act upon the buckets by means of what are called funnels, which are to direct it upon them obliquely. To form these funnels two rims are made like the rims of a water wheel; their interior diameters being such as to receive the top and bottom board of the wind wheel, and allow it to revolve within them. Pieces, like floats or buckets, are to be placed between these rims, the same in width and number as those in the wind wheel; they are not, however, so arranged as to point to the centre, but stand nearly at right angles to the buckets of the wind wheel. The outer rim thus made forms the funnels through which the wind is to blow upon the wind wheel; a certain number of the funnels receiving and directing it on to the floats, whatever may be its direction.

There are to be doors to the openings of the funnels, in order to close any number of them when the wind is too powerful. The claim is to the improved manner of applying wind as described.

The specification is very far from being clear, and the drawing, although well executed, is without written references, and does not represent some of the parts described; we think, however, that we have not mistaken the views of the patentee, although we are very far from entertaining the same hopes upon the subject which have been his prompters; we anticipate but little advantage from the use of his invention. The proposition of applying the said wind wheel to boats, and other vessels, is most absurd, as all the power which goes to move the wheel will be expended without producing any action upon the boat. Should the wind be ahead, the boat will go astern with a little less rapidity than it would were the wheel locked fast; and should the wind be fair, the greatest advantage will be taken of the wheel by preventing its revolution altogether, and allowing it to act merely as a sail, although it will be one of a very inferior kind.

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28. For a mode of *Constructing Mill Stones*, for grinding grain, hulling clover seed, &c.; Benjamin Myers, Chambersburg, Franklin county, Pennsylvania, September 28.

The lower stone, which is about two feet in diameter at the bottom, is to be the runner; its shape is conical, the sides forming an angle of about fifty-five degrees, until they are about nine inches in width, when they pass to an apex at an angle of twenty degrees. The bed stone, which is supported upon a frame above the runner, is hollowed to receive it, and has an eye through its centre; this stone may be six inches more in diameter than the runner, and about fourteen inches thick.

The claim is to the form of the bed stone and runner.

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29. For an improved *Chair, or Hospital Bedstead;* Williams Woolley, city of New York, September 28.

A narrow bedstead is to be made in the form of the four post bedstead, but so constructed as to be capable of being readily converted into an easy chair. The bottom is to be divided into three parts, the centre one of which is to be stationary, but the upper part is capable of being raised by a crank and pulleys so as to form the back of the chair, whilst the lower, or foot part, is capable of being let down to form the front of the chair, as it may then stand at right angles with the stationary part, which now forms the seat.

There are contrivances which answer as arms to the chair, and some other appendages not requiring particular notice. There is no claim made to any of the parts described, which appears to us to be a serious omission, as bedsteads, or couches, have been constructed which are capable of being raised and lowered much in the manner of that before us, and we ought, therefore, to have been informed what is new in it.

30. For an Economical *Baker and Roaster;* Philip Wilcox, Springfield, Hampden county, Massachusetts, September 28.

The action of this apparatus, and indeed its whole construction, so nearly resembles the ordinary tin kitchen, as to need but little description. The upper part is to be of sheet tin, arched, to reflect the heat. Moveable sheets of tin are to be placed below the meat, sloping from the front towards the back at an angle of forty-five degrees.

31. For *Self-guiding and accommodating Cars for Railways;* Levin Clark, Baltimore, Maryland, September 28.

To this car there are to be six wheels; the two fore wheels are attached to a frame separate from the main frame of the car, and capable of varying its direction so as to allow the wheels to deviate and adapt themselves to any curve. From this frame a connecting bar leads back to the axle of the next pair of wheels, and the apparatus is so arranged as to change the direction of these so far as to cause the three wheels on either side to run upon the required curve. The particular arrangement by which it is proposed to effect this object cannot be described without drawings. The locomotive engine is to be provided with two cylinders, each of which is to operate upon one of the remaining pair of wheels through the medium of distinct cranks. It is intended by this means to give different velocities to these wheels, corresponding to the curves over which they are to pass. How this is to be effected with the necessary precision we are not informed, and cannot tell. The steam engine is a very manageable instrument, but, we apprehend, not so perfectly controllable as this proposition would indicate.

The claim is to "the principle of *working two cylinders with one head of steam*, and the principle embraced in the *coupling or gearing*, by which the wheels will arrange themselves on the different radii of the tracks."

32. For the application of *Horse and other Animal Power, to move Machinery;* George Page, Keene, Cheshire county, New Hampshire, September 28.

There may be something very new in this horse power machine, but we have not yet found it out. An endless band is to pass over two cylinders placed at a proper distance from each other to allow the upper side of the band to form an inclined plane upon which a horse may walk. The band may be made of stout leather, and be covered with slats of wood bolted to it. Proper friction wheels sustain the slats, or floor, and run upon iron ways.

The claim is to the "application of horse power to move machinery for sawing wood, propelling boats, &c. &c. by an inclined band operating in the manner above described.

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33. For a *Grist Mill;* Ezra Brees, Kingston, Luzerne county, Pennsylvania, September 28.

The claims made by the patentee of this portable grist mill, are to the running of small stones about 400 revolutions in a minute, without pressure or artificial weight; the mode of preventing their heating; the manner in which the spindle, balance rine, and driver are made, &c. &c.

The particulars claimed are not clearly described, or plainly shown in the drawing; enough, however, is seen to prove that some of the points supposed to be new, are not entitled to this character.

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34. For *Machinery for Cutting and Punching Iron and Steel;* Jedediah Richards, Elbridge, Onondaga county, New York, September 28.

A bar of iron is bent round like spring shears, and one side of this bar is to be fastened to a bed piece of stout wood. The die against which the cutter or punch acts is fixed upon the lower side of the bar, near its end, and the cutter, or punch, is fastened to the other end above the die. A lever, with a long arm, is secured by straps, or cheeks, of iron, so as to act upon the two ends of the bent bar, and this lever, when depressed, forces the punch or cutter down by the power of its short arm. The bow of the bent bar serves as a spring to raise the punch, or cutter, when the power is taken off.

There is no claim made, nor do we perceive any thing upon which one could be fairly founded, excepting it be the mere bend in the bar acting as a spring; this arrangement is probably new.

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35. For an improvement in the *Re-acting Steam Engine;* Ambrose Foster, Brutus, Cayuga county, and William Avery, Salina, Onondaga county, New York, September 28.

In this engine, the steam is to issue from the opposite sides of revolving arms, as the water does from the rotary trunk of Barker's mill. The oldest steam engine known, that of Hero of Greece, acted upon this same principle; and numerous others have been constructed in modern times, which were to operate in this way. The present patentees do not pretend to be the inventors of this kind of engine, but to have devised such improvements as they believe will render it more efficient than it has hitherto been.

It is intended that the arms shall revolve within a drum or case; from this a tube is to conduct off the steam, a portion of which, when condensed, will serve, in part, to supply the boiler. The improvement relied on by the patentees consists in making the revolving tubes flat, instead of round, that they may be subjected to but little resistance from the atmosphere. They say that "in an engine which we have in actual operation, the arms are each twenty inches in length. The width of the arms at the centre is about six inches, and at the ends about two inches and a half. In depth, or thickness, they are about one inch and a half near the centre, and about three-fourths near the end. The size of the holes through which the steam escapes, is about one-fourth by one-eighth. The holes are so perforated that the steam shall issue at right angles with the shaft."

"We find it to be a point of great importance to give such a form to the revolving arms as shall subject them to the least possible resistance from the air; we, therefore, instead of making them in the form of round tubes, which has been heretofore done, give to them the form which results from making each half of the arm a segment of a large circle; so that when the two halves are united, the edges of the tube present acute angles. The tubes, however, may be made elliptical, or oval, and the same end will be in a great measure attained. We use any number of such arms on the same shaft, as we may find best adapted to our purpose."

"We do not claim to be the inventors of the reacting steam engine, nor of the case, or drum, within which we intend the arms shall in general revolve; but what we claim as our invention is simply the giving the oblate or flat form to the revolving arms, so that in proportion to their capacity they shall experience much less resistance from the air than that to which they have been heretofore subjected, thereby obtaining a greatly increased power."

We have been induced to give more room to the notice of this engine than we should otherwise have done in consequence of the information contained in a letter recently received from one of the patentees, that it had been in continued use ever since the issuing of the patent, in a factory owned by him, and had fully justified all his anticipations.

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36. For an improvement in the *Apparatus for Distilling Spirituous Liquors;* Lemuel Wellman Wright, a citizen of the United States, now residing in London, England, September 28.

This apparatus consists principally of an alembic, a rectifying cistern, and a refrigeratory, each of them having something peculiar in its construction. In the body of the still there is to be a plate of copper which may be fifty feet long, and a foot wide, bent into a helical form, like the main spring of a watch, which is to be fixed upright on the bottom of the still, forming a spiral channel from its centre to its sides. The liquid to be distilled falls in a continued stream into the centre of this coil, and in its circuitous rout to the discharge cock, is to be deprived of all its alcohol. Instead of a spiral, the plate may be bent in a zigzag, or other, manner.

The wine, or wash cistern, is fixed above the rectifier, and the liquid passes from one to the other through a regulating cock, and falls upon a copper tray-like shelf, perforated with holes, and through these it passes, in a fine spray, on to successive shelves, in a similar manner. The vapour from the still passes into this rectifier, and not only heats the wash, but subjects it to a steam distillation. The vapour which is thus formed escapes through a tube into the refrigerator, where it is condensed.

A self-regulating apparatus is employed to govern the admission of the wash, and the temperature of the rectifier; this regulator operates upon the principle described in Mr. Wright's patent for a "heat governor," of which we gave some account in the last number, p. 110.

The patentee states that he does not claim any of the known mechanical parts described by him, separately, but the combined and improved arrangement as set forth in his specification.

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37. For *Rendering Tin Plate more durable when used for various purposes, by Coating it with Lead;* Joseph M. Truman, city of Philadelphia, September 29.

(See specification.)

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38. For a *Machine for the Manufacture of Barrels,* Tubs, and other Cooper's ware; John Cole, of Belpree, Washington county, and Samuel Miller, of Athens, Athens county, Ohio, September 29.

This machine is intended to perform the various operations of shaving the staves and hoops, jointing the staves, turning and dowelling the heads, dressing the ends of barrels, cutting the croes, and facing the heading.

Any adequate power is to be applied to give motion to the machinery, through the intervention of cog wheels, drums, and other gearing. Three are to be fixed cutters through which the staves, or hoops, are to be forced by rollers. The jointing is to be effected by means of a knife, somewhat in the shape of a V, but with a much more obtruse angle; this knife is to be bent into the proper curve, and fixed across a frame working in cheeks like a saw frame; the stave is to be held down upon a suitable bed piece, and is then jointed by the descent of this knife, which must be equal in length to that of the stave. Such a knife, applied to the same purpose, formed a principal feature in a patent noticed by us a few months since. The part for shaping the heads, is a kind of lathe; and the dressing the ends of the barrel, and forming the croes, is also effected by revolving cutters.

The claim is to "the above described machine," which would be very well was it new in all its parts, but this is not the case.

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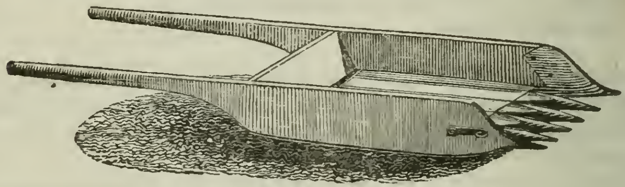
39. For an improvement in the *Bark Mill;* Charles H. Green and Richard Montgomery, Sangerfield, Oneida county, New York, September 30.

The general construction of this mill is that of the cast iron bark mills most commonly used. The improvements claimed are principally in the knives and ridges for breaking the bark; to these, such a form is given as the patentee thinks will be most effectual in attaining the end proposed. Besides the particular formation of the parts mentioned, they also claim the "constructing the hopper and its several apartments and partitions entire, and of cast iron." By the hopper, in this case, is meant the exterior stationary box, or body of the machine, which has often been made "entire and of cast iron."

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an Excavating Scraper, being an improvement on the common scraper used for removing earth. Granted to DUDLEY MARVIN, *of Canandaigua, Ontario county, New York, September* 2, 1831.



To all whom it may concern, be it known, that I, Dudley Marvin, have invented an improvement in the scraper used for the removal of earth, for various purposes, which I denominate the "excavating scraper," and that the following is a full and exact description of my said invention.

Instead of the straight, cutting edge of the scraper, I substitute any convenient number of cutting shares, or points, as shown in the accompanying drawing. These may be of cast or of wrought iron, or of iron and steel; I prefer cast iron, however, as being the most economical. The sides of my scraper are armed with plates, or cutters of metal, which are brought out to a point corresponding with the shares, or cutters, before named, and are so formed on their edges as to cut and clear the earth in the most perfect manner. The body of the scraper I in general make of wood, in the usual manner, but I give a greater height to the sides and back than is ordinarily given, as it will carry a much greater load than the common scraper. In order to strengthen the wood, and to provide firm attachments for the cutting points, and runners upon which the scraper will advance with facility, I generally pass bars of iron across, both at the front and rear, whilst other bars, serving as runners, pass not only under the sides of the scraper, but may also extend from front to rear, from each of the cutting shares, or points. To these bars the points are attached by screw bolts, the heads of which are countersunk, and the nuts received in excavations prepared for the purpose, and therefore offering no resistance to the sliding of the scraper.

With an instrument of this description, earth may be excavated and removed, without the necessity of first ploughing the ground, the animal by which it is drawn, walks, consequently, upon firm ground, and the whole business is greatly facilitated.

What I claim as my invention, and for which I ask a patent, is the employment of cutting shares, or points, with the sides to correspond with them, operating upon the principle herein set forth and specified.

DUDLEY MARVIN.

Specification of a patent for an Inclined Plane Excavator, for excavating and removing earth. Granted to DUDLEY MARVIN, *of Canandaigua Ontario, county, New York, September* 2, 1831.

To all whom it may concern, be it known, that I, Dudley Marvin, have invented a new apparatus for the purpose of excavating and removing earth, which I denominate the inclined plane excavator, and that the following is a full and exact description thereof, reference being had to the accompanying drawings which make a part of this specification.

The carriage part of the apparatus need not be particularly described, as it differs from such as are in use in those points only which adapt it to the machinery for excavating and loading, to be presently described. The main principles upon which the operation of this machine depends, is the employment of an excavator of a particular construction, to plough, or break up, the ground, and the raising and delivering it into the car when thus broken, by means of an inclined plane formed by an endless apron, or aprons, kept in motion by a revolving roller, or drum.

Fig. 1.

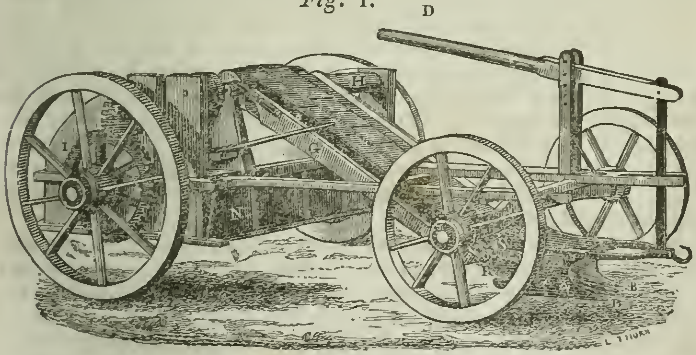
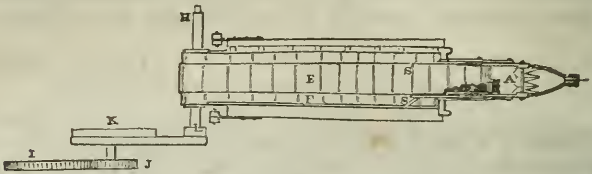


Fig. 1, in the drawings, is a perspective view of the machine; and Fig. 2 is a plan of the same, or rather of such parts as are required to be shown. A, is the excavator, or plough, for breaking up the ground; it is usually made of cast iron. The front or cutting edge of it is generally formed of pointed teeth, or shares, B, B, Figs. 1

and 2. The edges may, however, be made straight, or otherwise. Its under part, or sole, lies on the ground, like a shovel, and it has sides rising from it at right angles, or nearly so, as seen at C.

Fig. 2.



When the carriage is drawn forward, the plough, or excavator, is allowed to enter the ground to the required depth, this being regulated by the lever D, or by any suitable contrivance producing the same effect. The earth is delivered from the excavator, on to an endless apron, or endless aprons, at E, F. In the drawing, one of these aprons, E, is made narrow to receive the earth immediately from the excavator; this, at its lower end, passes over a roller appropriated to itself, immediately under the rear of the excavator as it rises from the sole, forming a commencement of the inclined plane. By this apron it is conducted up between the cheeks, or sides, of the excavator. The wider apron, F, when two are used, passes, at its lower end, round a roller extending across the inclined plane which it forms, and running in the cheeks G, G.[*] At the upper end of the inclined plane, there is a drum, or cylinder, H, over which both the aprons pass, and from which they receive their motion.

The drum, or cylinder, above named, is made to revolve by a gearing connecting it with one of the hind wheels of the carriage. This may be effected in various ways, one of which is shown in the drawings. I, is an iron cog wheel attached to the inner end of the hub, or nave, of the hind wheel, and turning with it. J, is a pinion driven by the cog wheel, and having on its shaft the wheel K, a strap, or band, from which causes the drum, H, to revolve and to carry the endless aprons upon it. These wheels and whirls bear such proportions to each other, as shall give to the aprons a motion corresponding with that of the carriage, forward. The endless aprons are supported by a sufficient number of rollers under them, turning on gudgeons on the cheeks G, G.

N, is the body of the car, into which the earth falls from the endless aprons. This may be so constructed that, when loaded, it may be removed on separate wheels, and have its place supplied by another car. I do not claim any particular mode of doing this, as it may be effected in various ways; nor do I think it necessary to exhibit, or describe, those parts which are of minor importance, as every workman would vary these according to his own judgment or fancy.

The inclined plane is hinged to the carriage to allow it to rise and fall by the action of the lever D. In the strap of the hinge fastened to the cheeks of the inclined plane, I usually make slots in which the screw bolts are allowed to slide, for the purpose of tightening the aprons when requisite.

Fig. 3, is the inside of one of the cheeks; it has through it a slot, or mortise, there being a corresponding one on the opposite cheek. Into these slots, pass iron pins, projecting laterally from straps of iron attached firmly to the lower end of the wooden cheeks of the inclined plane. The play allowed by these slots, admits of a free motion of the plough to a certain extent, either up, or down, or longitudinally. It can, consequently, be depressed, according to the depth of hold which it is intended to take in the ground, or raised, until checked in a way to be presently described. The plough, by this mode of attachment, adapts itself also to its varying position in the draft.

Fig. 3.

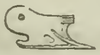


Fig. 4.

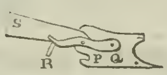


Fig. 4, is the outside of one of the cheeks. To this is attached a strap, or stop, P, by means of screw bolts Q, Q, or otherwise. When the plough is raised by means of the lever D, the end of the strap is brought into contact with the iron bar R, when a further action upon the lever will raise both the plough and the inclined plane.

S, Figs. 1 and 4, is a piece of sheet metal, playing freely around a bolt seen in Fig. 4; there being provision made between the strap P, and the cheek for that purpose. This, or rather these pieces of metal, serve to guide the earth as it passes from the elevated part, at the rear of the plough, until it arrives, or is delivered, on to the wide apron. Its rising and falling freely, prevents it from being affected by the varying inclinations of the plough, and allows its lower edge always to remain in contact, or nearly so, with the apron. The ends of these plates are seen at S, S, Fig. 2.

I have herein described the general construction of this machine, and have pointed out various particulars in the arrangement of some of its parts without intending, even where they are new, to claim them as making any part of my invention, as the same end may be attained in other ways, without altering the main principle upon which the action of my inclined plane excavator depends.

It will be seen that the above principle is applicable to the formation of trenches for the foundation of rail-roads, and also to the digging of ditches; the principal alteration necessary in these cases, being the constructing of the apparatus in such a way that the plough and inclined plane may descend to the required depth below the ground on which the wheels rest. I also contemplate the using it for the deepening of harbours, canals, and other waters; in which case, a boat, scow, or other suitable vessel, may be substituted for the wagon, or carriage, on land; the requisite power may be obtained from a steam engine, or other means, according to the nature of the labour to be performed.

In applying it to the digging of ditches, or trenches, the apparatus may be so modified that, instead of loading the earth into a cart, it may be thrown on either side of the trench, or ditch, when it is desired to form a bank. Every competent machinist will at once perceive that practical modes of effecting these ends are easily devised, and that they may be modified in various ways, whilst the principle of elevating by the inclined plane, is still preserved.

What I claim as new, and for which I ask a patent, is the delivering the earth from the plough, or excavator, as above described, on to an endless revolving apron, or aprons, forming an inclined plane; and by such apron, or aprons, to carry the earth up so that it may be delivered into a car, or other convenient receptacle, or deposit it upon the ground upon the principle hereinbefore described; that is, by the use of the said revolving endless aprons.

DUDLEY MARVIN.

Specification of a patent for an improvement in Water Wheels. Granted to JOEL EASTMAN, *Bath, Grafton county, New Hampshire, September* 28, 1831.

(WITH A COPPERPLATE.)

To all whom it may concern, be it known, that I, Joel Eastman, have invented a new and useful improvement in the construction of water wheels, and the application of water thereto, and that the following is a correct description thereof.

To a vertical or horizontal shaft I attach two or more floats made of wood or iron, their proper proportions being about two feet long and one foot wide, making a wheel four feet in diameter and one foot long. This wheel is enclosed in a tight curve or case, fitting the wheel closely, and making part of a close trunk, or penstock, extending from the flume into the dead water at the bottom of the fall.

Should the necessary power and motion require it, two or more wheels may be attached to the same shaft, each wheel having its water conveyed to and from it separate from the others. For a vertical shaft there should be a penstock or close trunk, extending as high as the opening for the escape of the water from the upper wheel, and into the water at the bottom of the fall, into which penstock the water passes through an opening from each wheel, each opening being not less than five times as large as that by which the water is admitted into the wheels.

What I claim as my invention is a water wheel, or wheels, constructed in the manner above described, being enclosed in a case, the case being connected with, and forming part of, a tight penstock, or flume, extending the whole height of the fall, and the application of water to the wheel in the manner explained, however the same may be varied in practice.

JOEL EASTMAN.

Explanation of the Drawings. (Plate 3.)

Fig. 1, is a bird's eye view of the wheel and its curve, or case, with the openings for the admission and discharge of the water; the top, Jour.l Frank.n Inst.e Vol. IX Pl. 3.

Fig. 1.

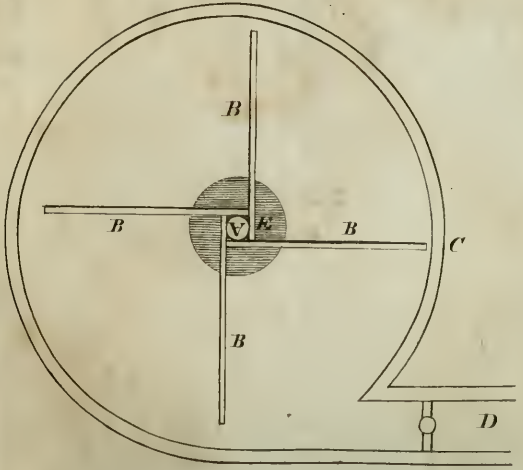
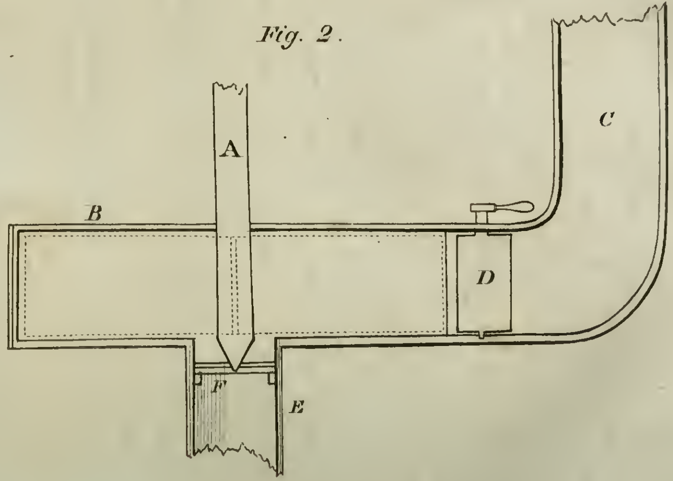


Fig. 2.



J. Eastman's Water-Wheel

or cover, of the case being removed for the purpose of showing its interior.

A, is the shaft to which the floats are attached.

B, B, the floats, which, in width, are equal to the depth of the case.

C, the edge of the curve, or case, the inside of which is not a circle, but is so formed that the ends of the floats approach more nearly to it as they pass round from the aperture for the admission of water, and almost touch it when they again arrive at it.

D, the aperture for the admission of water on to the wheel.

E, the opening through the bottom of the case into the descending trunk through which the water escapes.

F, the gate or valve to regulate the flow of water on the wheel.

Fig. 2, is a vertical section of the case, a part of the trunk, &c.

A, the shaft, passing through the cover, and giving motion to the machinery.

B, the case, or cover, the dotted lines within which show the floats.

C, the tube, or trunk, through which water is admitted on to the wheel.

D, the gate, or valve.

E, the descending trunk, extending to the bottom of the fall.

F, a bar across, serving as a step to the shaft.

Specification of a patent for rendering Tin Plate more durable when used for various purposes. Granted to JOSEPH M. TRUMAN, *city of Philadelphia, September* 29, 1831.

To all whom it may concern, be it known, that I, Joseph M. Truman, of the city of Philadelphia, have invented a method of rendering tin plate more applicable to various uses than the ordinary manner of employing it with a simple coating of tin upon the iron, and that the following is a full and exact description of my said invention.

The purpose which I have in view is to preserve the iron more effectually from rust, and consequently to render the plates much more durable than heretofore, when employed for the covering of roofs, the making of pipes, gutters, cisterns, bathing tubs, and various other articles. In order to attain this end, I cover the tin plates with a coating of lead, by immersing them in a bath of that metal in a state of fusion. For most purposes, I dip the plates singly into the lead, after having dusted them with powdered rosin, or any other suitable flux, after which I unite them together in the usual way.

When required for gutters, I generally groove the sheets together, so as to form strips of convenient length; these strips are then passed through the melted lead; immediately from the bath I cause the strips to pass between one or more pair of rollers, which rollers may be made of wood, or of metal covered with several folds of cotton cloth, or other yielding substance: these rollers I keep greased with oil or tallow.

I have thus described the mode in which I usually effect the proposed object, but I do not claim the particular implements or method employed as making any part of my invention; but what I do claim, and for which I ask a patent, is the covering of tin plate with a coating of lead, and applying the plates so coated to the purposes hereinbefore set forth.

Joseph M. Truman.

ENGLISH PATENTS.

Specification of the patent granted to Peregrine Phillips, Jr. *of Bristol, in the county of Somersetshire, Vinegar Maker, for an improvement in manufacturing Sulphuric Acid. Dated March* 21, 1831.

To all to whom these presents shall come, &c. &c. *Now know ye*, that in compliance with the said proviso, I, the said Peregrine Phillips, Jr. do hereby declare the nature of my said improvements is herein set forth and explained: but for the better understanding of the subject, I shall first describe the present mode of manufacturing sulphuric acid; next, the improvements I propose to effect; and then the means by which those improvements are effected. Sulphuric acid, or oil of vitriol, is generally manufactured at present by the combustion of sulphur, or brimstone, and saltpetre, either mixed together and placed in large leaded chambers, or separately in ovens connected with those chambers, into which chambers more or less of atmospheric air is admitted; the sulphur at first is converted by the combustion into sulphurous acid gas, and then, by the agency of nitrous gas, unites with oxygen from the atmospheric air in the chamber, or from that liberated from the saltpetre, and is thus converted gradually into sulphuric acid, which is afterwards absorbed by the water which covers the bottom of the chamber.

The first improvement then which I propose to effect, is an instantaneous union of the sulphurous acid gas with the oxygen of the atmosphere, and thereby to save the constant expense of saltpetre, and also the great outlay of capital in the chambers where any great quantity of sulphuric acid can be manufactured, by the gradual conversion of the sulphurous acid into the sulphuric acid. The second improvement I propose to effect, is to attain a more perfect condensation of sulphuric acid when made, by an improved mode of absorbing the same.

The first improvement then, namely, the instantaneous union of sulphurous acid with the oxygen of the atmosphere, I effect by drawing them in proper proportions by the action of an air pump, or other mechanical means, through an ignited tube, or tubes, of platina, porcelain, or any other material not acted on when heated, by the sulphurous acid gas. In the said tube, or tubes, I place fine platina wire, or platina in any finely divided state, and I heat them to a strong yellow heat, and, by preference, in the chamber of a reverberatory furnace; and I do affirm that sulphurous acid gas, being made to pass with a sufficient supply of atmospheric air through tubes as described, properly heated and managed, will be instantly converted into sulphuric acid gas, which will be rapidly absorbed as soon as it comes in contact with water. The sulphurous acid gas I cause to be generated by the combustion of sulphur or pyrites, or any other metallic sulphuret, in a close oven, having one or more apertures for the admission of atmospheric air, and another aperture leading to, or communicating with, the aforesaid tubes. The relative proportions of sulphurous gas and atmospheric air are regulated by the size and working of the air pump, which must pump out at least eighty-five cubic feet of air for every pound avoirdupois of sulphur consumed.

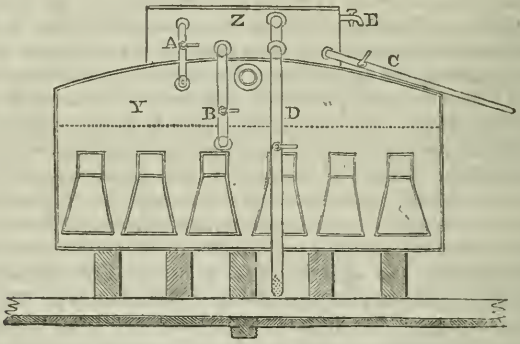
My second improvement, namely, a more perfect condensation of the sulphuric acid when made, I effect thus; I cause a chamber, or chambers, to be erected, of any size and materials that may be thought convenient, but by preference, of silicious stone, in a circular form, and about eight feet in diameter, and thirty feet high: this I cause to be lined, nearly, or throughout, with lead, to be filled nearly to the top with silicious pebbles, or any substance presenting an extensive surface, and not acted upon by the sulphuric acid. Upon the pebbles, or other substances, I place a sheet of lead pierced with small holes, for the better distribution of the liquor to be hereafter mentioned. The chamber is to be domed over, and rendered air tight on the outside, except by an opening on the top, through which a quantity of water, or dilute acid, is let in upon the pebbles to the height of about fourteen inches. A lead pump is fixed by the side of this chamber, drawing the liquor from its bottom, and emptying its contents into a lead funnel, placed in and over the aforesaid opening in the top of the dome, and which said pump is kept constantly worked by a steam engine, or any other power that may be preferred. The pipe of the funnel must be of such a size as always to keep some liquor in the funnel, and never to allow any air to pass down that way into the chamber; and the pump must throw a sufficient quantity of liquor to keep all, or the greater part of the pebbles moistened. A pipe, leading from the ignited tube, or tubes, after passing through some water for the purpose of cooling it, terminates in this chamber, just above the top of the liquor, whilst another pipe, going off from the top of the chamber, leads to the air pump, so that all the air charged with sulphuric acid, has to pass through the bed of moistened pebbles, which have a constant supply of water, or dilute acid, continually passing down them.

When the liquor is considered sufficiently charged, or when it will not absorb the sulphuric acid gas, which may be known by examining the air discharged from the air pump, it is to be drawn off by a pipe and cock in the bottom of the chamber, and treated in the usual way.

Note.—I do not claim a right to any mode by which sulphur or sulphurets may be converted directly into sulphuric acid by the action of heat or otherwise, if such method ever has been or ever shall be discovered; but I claim an exclusive right to any plan by which sulphurous gas and atmospheric air, either alone, or mixed with any other gas or gases, shall be either forced or drawn by an air pump or any other mechanical means, through an ignited tube or tubes. I also claim the exclusive right to the use of platina in any finely divided state, for the purpose of assisting the action of heat in combining sulphurous gas with oxygen in the manufacture of sulphuric acid. I likewise claim an exclusive right to every mode by which chambers used in the manufacture of sulphuric acid, can be charged with silicious pebbles, or other substances, for the purpose of exposing extensive surfaces, and which surfaces can be either constantly or occasionally moistened by the liquor pumped or drawn from below them. [*Rep. Pat. Inv.*

Specification of the patent granted to SAMUEL SEAWARD, *for improvements in apparatus for economising Steam, and for other purposes.*

To all to whom these presents shall come, &c. &c. *Now know ye*, that in compliance with the said proviso, I, the said Samuel Seaward, do hereby declare that my improvement, or improvements, in apparatus for economising steam, and for other purposes, are fully ascertained and described as follows, reference being had to the drawing hereunto affixed.



I form a vessel, Z, of iron, or other suitable material, and capable of withstanding the heat of the steam contained in the boiler, Y, and of resisting the pressure of the atmosphere, and of a capacity equal to one-twentieth of the water chamber of the boiler, or thereabouts; this vessel I call a receiver, and it is to be placed on the said boiler, Y, as shown in the drawing, or any where near the boiler, of a sufficient height, that any fluid contained in the said receiver, will descend by its own gravity into the steam boiler. To this vessel I attach four cocks, or valves, and as many pipes, in the following order, viz. one pipe, A, from the top of the vessel Z, to the steam chamber of the steam boiler; one pipe, B, from the bottom of the said receiver Z, to the water chamber of boiler; one pipe, C, from the bottom of the said receiver to the water outside the ship; and one pipe, D, from the top of the said receiver, to the well, or lowest part of the ship, in which the boiler is placed.

The first operation of this apparatus for the effecting the saving of fuel, is as follows:—When the steam is so high as to raise the safety valves and escape, either in consequence of the engines standing still, or the too great quantity of fire, the cock A is to be opened, and the receiver Z filled with steam, the air rushing out by a small cock E, placed at the top. The receiver being full, the cock A is to be shut, and also the cock E, and the cock C opened; the steam contained in the said receiver will, by this operation, be condensed, and a partial vacuum thereby be formed; the water will then rush from outside the ship, and fill the receiver; the cock C being then shut, and the cock B opened, the water will descend slowly, by its own gravity, into the water chamber of the boiler; and this can be accelerated by again opening the cock A, by which means the water will descend at a heat not much below that of boiling water. The saving of fuel will be evident, because at all times, the boiler may be completely filled, and the water itself raised to a high temperature by the steam, which would otherwise escape at the safety valves, and be completely lost.

The second operation is that of pumping, or drawing the water from the hold of the ship. To effect this, the cock A is again opened, and the receiver thereby filled with steam; upon closing the cock A, the cock D is opened, and the water will rush up from the hold of the ship, and fill the receiver; the cock D being shut, and the cock C opened, the water contained in the receiver will run overboard by opening the small air cock E in the top. This operation can be repeated till the ship is perfectly dry: fifty or sixty tons of water per hour can be discharged with great facility in a boat of 100 horses' power, by simply employing the spare steam while the engines are at rest.

Now having described my improved apparatus, I do hereby declare that I claim the same when applied to the boilers of steam engines employed on board packet boats, and other vessels, for economising steam, and for the other purposes hereinbefore mentioned; but not when employed for any other purpose.

Observations.

The advantages to be gained by the application of this apparatus are two-fold:—*first*, the most perfect economization of the fuel, inasmuch as all the steam generated in the boiler, is applied usefully; and, *secondly*, the application of the steam power in a most simple and efficacious way, for the purpose of pumping or discharging the bilge water out of the hold of the ship or vessel.

Any one who has been in the habit of witnessing the steam vessels on the Thames, for instance, must feel satisfied of the immense loss of steam, and, consequently, the expenditure of fuel, occasioned by the steam roaring out of the waste pipes in the abundant manner it is accustomed to do, previously to starting, while running, and at the end of the voyage; for it must be borne in mind, that all the steam so escaping is attended with actual loss, carrying with it a great portion of heat, at the same time that the passengers are inconvenienced by the great quantity of warm water and argillaceous matter falling upon the deck. By the adoption of the present apparatus, however, the loss and the nuisance are both avoided, for the steam, instead of being allowed to escape, is condensed; the heat is secured and returned again into the boiler.

To be able, therefore, at all times when there is the least particle of steam in the boiler, to fill it up with water the required height for starting, and also to discharge any quantity of bilge water out of the hold of the ship, and that in a very rapid manner, without the aid or intervention of pumps, or even setting the engine to work, are advantages of too great consequence to be overlooked. All these advantages considered, we may confidently suppose that this apparatus will be found of no common importance to the interests of steam-boat proprietors, by rendering their engines more extensively available, and thereby increasing the value of steam-boat property. The expense of such an apparatus complete for 100 horses' power, would, it is presumed, be about £100. [*Rep. Pat. Inv.*

Patent granted to William Morgan, *of York Terrace, Regent's Park, Esquire, for improvements in Steam Engines. Dated February* 14, 1831.

The discovery here is to produce a perfectly rotary motion from the action of a piston whose oscillation is but partial. Suppose the piston of a steam engine, particularly one of those for which Elijah Holloway procured a patent, oscillates within a cylinder, in a semicircular action; or suppose it performs a greater or a smaller proportion of a perfect revolution. In this case it would be a manifest advantage, applicable to a variety of purposes, which engineers and mechanics will at once comprehend, to procure from this imperfect revolution of the piston, a perfect rotary motion. This may be done in several ways. By a chain, or strap, secured to a drum round the piston and to a beam, at the further end of which is a crank, two oscillations of the drum round the piston, and, relatively, of the beam, will complete a perfect revolution of the wheel at the end of the crank. The same effect may be produced by cog wheels in the drum and moveable beam, and by other means.

The improvement claimed by the patentee is, the production of perfect rotary motion from the partial oscillation of the piston of a steam engine. The means of producing this are various, and the patentee lays no claim to any express apparatus for the purpose. A beam attached to a knee, or joint, fastened on to the piston, and describing one portion of a circle, at the end nearest to the piston, and another portion at its opposite extremity, may have a crank affixed to it in such wise, as to produce the same effect.

The improvement is evident, and the variety of its powers of application surprising. [*Rep. Pat. Inv.*

Notice of a patent granted to JAMES THOMSON, *Esquire, for improvements in making Printing Types. Dated February* 14, 1831.

AN indictment for arson charges the wilful fire-raiser with malice aforethought, and diabolical designs against our lord, the king, his crown and dignity; in that he, the aforesaid fire-raiser, did, at time and place aforesaid, with intent aforesaid, kindle many fires, to wit; two fires, &c. &c. with intent that the said fire should burn to the end of the world.

However true or false this description may be of the beginning of a fire, it is strictly applicable, changing malice into benevolence, to him who makes and publishes a useful discovery. However trivial in itself, its flame may burn to the end of the world: and as each passer by throws his portion to the flame, it augments incalculably.

Thus, the inventor of types of wood, would be astonished at the sight of fonts of metal, and the modern compositors were staggered when distinct letters were cast by a page at a time, in the shape of stereotype plates.

The present discovery would surprise the inventor of stereotype. It is to reduce the plates of metal back to single types; not, however, as the rupees and pagodas of India are struck from a silver sheet of the veda; but the necessary letters being first set up with wide spaces, and broadly "justified," as the compositors say—that is, widely divided between the lines, the mass is put into an iron box, and a plate cast thence, precisely as is the case with stereotype; the plate, however must be as thick as the type is to be long. By the operation of one or more circular or common saws, the plate is again subdivided into letters, which are used as types are. [*Ib.*

Notice of a patent granted to JEREMIAH GRIME, JR., *Copperplate Engraver, for a method of Dissolving Snow and Ice, on the Trams or Rail-ways. Dated February* 21, 1831.

MR. GRIME's invention would effectually answer the purpose intended, provided he had been satisfactorily explicit upon one branch of the provisions required to bring it into action. This will be alluded to in its proper place. The main obstacle we anticipate, and which would occur to every reader of his specification, is the enormous additional expense that, upon its adoption, would accrue to the proprietors of the rail-ways. He proposes to lay by the side of, or under the trams, tubes, for the purpose of conveying steam or boiling water, which is to be prepared in boilers at equal distances of two or three miles apart upon the road; each boiler to have a connecting cistern to receive the cold water from the hollow tubes or trams, with, of course, a feeder to supply them with the hot water or steam. The latter operation can be easily effected upon the principle of its expansive power; Mr. Grime, however, so far as we have examined and comprehended his plan, has not explained the mode in which he proposes to feed the cisterns with the cold water already in the tubes; that is, taking for granted that the tubes are already filled with cold water, how this is to be returned to his boilers for the purpose of being heated we are not told.

To allow for the expansion of the metal, he has provided "small copper sliding tubes, to be inserted in cavities formed in the joints to receive them, and in order to provide for a renewal of this sliding tube when it becomes so much worn as to leak. [*Ib.*

Notice of a patent granted to WILLIAM ALLEN, *London, Piano Forte Maker, for "improvements in Piano Fortes." Dated the 20th July,* 1831.

SINCE the introduction of cast iron frames for piano fortes, considerable expense has been incurred in drilling the holes for, and fitting in, the pins, by which the strings are brought to any required degree of tightness, and considerable difficulty has been experienced in making the tightening pins fit into the holes, so as to turn with facility, and at the same time to preserve their position, and the required tension of the strings. These objections to the cast iron frames Mr. Allen has remedied, simply by casting the two dove-tailed grooves along that end of the frame where the tightening pins are to be inserted, and driving pieces of wood of a corresponding shape to fill up the dove-tailed grooves, and to receive the turning pins. It is evident that by this ingenious and simple contrivance, the expense of manufacture will be diminished, and the instruments will be improved. [*Reg. of Arts.*

Notice of a patent granted to WILLIAM ALLTOFT SUMMERS, *Engineer, and* NATHANIEL OGLE, *Esquire, for their having invented certain improvements in the construction of Steam Engines, and other Boilers, or Generators, applicable to propelling Vessels, Locomotive Carriages, and other purposes. Sealed* 13*th April*, 1830.

THE steam boiler, or generator, described by the inventors in their specification of the above patent, and claimed by them as their invention, consists in forming the boiler of a number of tubes or cylindrical chambers, placed in a vertical position, having other smaller tubes, or flues, passing through them, for the passage of the hot air or ignited gas from the furnace below; the larger tubes or chambers contain the water to be heated, and are connected together at both ends by horizontal tubes or pipes. The supply of water is forced into the vertical chambers by a force pump through the horizontal tubes at the bottom; and from the upper horizontal tubes, the steam is passed by a pipe off to the engine.

The inner tubes, or flues, form a complete passage for the heated air, from the furnace crosswise through horizontal tubes, and throughout the larger cylindrical chambers from end to end; the whole apparatus is surrounded by a casing of metal, by which the heated air is also made to pass up through the spaces between the outsides of the larger cylindrical chamber; whereby the water contained in them is exposed to a very much extended surface of heated metal, on both the insides and outsides of the cylindrical chambers.

The patentees state, that they do not limit their claim of invention to any precise form, as the tubes, or vessels, may be elliptical, or of any other convenient form which would answer the purpose; but they claim as their invention the placing of an inner flue, or tube, for the escape of the heated air, or gas, arising from the fire inside a larger tube or vessel, in a perpendicular position; the said inner flues running through the inside of the larger tube, or vessel, and out at the top, the larger vessel being also placed in a perpendicular position. [*Lond. Jour.*

On Sugar from the Seckel Pear.

[The following communication from Mr. Brasier to the College of Pharmacy, was deemed of such importance as to be referred to a committee, whose able and detailed report we also have the pleasure of laying before our readers. Should experiments on a large scale prove equally satisfactory as those of Mr. Brasier, there can be but little doubt of the great value of this fruit in the manufacture of sugar. The greatest drawback to its extended propagation for this purpose is the time required for the tree to come to maturity, though, when an orchard has once reached the bearing age, the expense of procuring the sugar from the fruit will be incomparably less than that incurred either in the cultivation of the cane or of beet roots. We trust in the course of the ensuing year to present the results of further experiments on this subject, and we would suggest to such of our readers as have the opportunity, the value of comparative examinations of the juice of various other varieties of the same fruit.]

Philadelphia, October 20th, 1831.

The remarkable sweetness of the Seckel pears, which are cultivated at the country residence of my father, induced me to attempt to obtain sugar from them. In 1826, I commenced experimenting on them, with a view of separating the saccharine matter they contained: after treating the juice with lime, I concentrated it until its boiling point stood at 230° Fahrenheit, (the degree required for crystallizing sugar,) and obtained a sirop of a pleasant taste, and of the colour of fine molasses.

The two succeeding years I obtained nearly the same results, but the sirop, as in the other case, would not crystallize; I have some at present, which still remains in the same state.

But in 1829, the season being favourable for fruit, I procured some very fine, the juice of which, (it was a grayish colour with a light tinge of orange, which last colour deepens in a very short time,) I heated nearly to the boiling point, neutralized and separated the feculent portion by treating it with an excess of lime, which, when precipitated, left a clear aqueous sirop of a light straw colour, of the specific gravity of nearly 1075. I then neutralized the excess of lime remaining in the sirop, concentrated and clarified it with ivory black, and reduced it until its boiling point marked 220° Fah. Having been prevented from attending to it for a few days, when I proceeded to terminate the concentration, I perceived that it had become so glutinous and ropy, I feared it would burn in the operation; I therefore put it into white glass bottles. It was clear, and of a fine yellow colour.

Eighteen months after this, some fine white crystals had formed, resembling those from sugar cane; (rock candy.)

Last summer I treated some juice in the same manner, but owing, I believe, to the unsoundness of the fruit, (the season being unfavourable,) the sirop was dark, and acquired a taste from the ivory black, which was of inferior quality. I then exposed the sirop in evaporating pans, in a hot atmosphere; it thickened, but has not yet crystallized, whilst the glutinous sirop of 1829, crystallized almost entirely, although the crystals were darker than those formed while cold.

Business calling me from the city, I submit to you the experiments, that you may continue them if you think proper, and take the liberty of calling your attention to a fruit which, though of a delightful flavour, is scarcely known beyond the vicinity of this city. I estimate its value for sugar, from the knowledge that its juice can be as easily and cheaply obtained as that of the apple, and that it contains near two pounds liquid sugar per gallon, whilst its agreeable flavour and sweetness leave little doubt of the quality and strength of the perry or vinegar that could be obtained from it.

That these feeble instructions may lead to the creation of a new branch of industry, is the sincere wish of

Your obedient servant,

Amable J. Brasier.

The committee to whom was submitted the sugar and sirops prepared by Mr. Brasier, and presented by him to the College, beg leave to report:

That so far as they have been able to ascertain, the sugar obtained by Mr. Brasier from Seckel pears, possesses all the properties of the crystallized cane sugar, and in no respect does it seem to differ from it. Its taste, crystallization, solubility in water, &c. are exactly the same. Three samples have been submitted to the college; the one very white, and in regular crystals; another, a little inferior; and the third sample, in a granular state, of a grayish colour, possessing the appearance and smell of dry Brazil sugar of an inferior quality.

Mr. Brasier left for the committee, two bottles of sirop made from the Seckel pear; one containing the sirop made in 1829, and which afforded the samples he produced; the other was the sirop he made last year. The principal object of the committee was the investigation of these two sirops, with the view of depriving them of their glutinous properties, as this was probably the only cause of the difficulty in the one case, and the impossibility in the other of obtaining crystallized sugar. Your committee having at their disposal but a small quantity of these sirops to experiment with, had little hope of success; but they have not been deterred from undertaking the task, though their experiments may have proved few and unsatisfactory. They expect to be able next year to institute a series of new experiments upon the fresh juice of the Seckel pear, and to submit to the college a more ample and satisfactory report than this. Mr. Brazier's discovery involves, undoubtedly, a very important question—whether the northern climates are not as capable of producing sugar as the tropical. We hope that your committee will receive the assistance of persons interested in the promotion of science, manufactures, and national wealth, and that scientific and enterprising men, led towards the same object, will communicate to us the result of their own labours.

The first sirop made in 1829 is perfectly transparent, of a light straw colour, and holding in suspension a considerable number of small prismatic crystals; its consistence is viscous and ropy, and its sp. gr. 1.365; heated in a sand bath it became more fluid, but still retained its ropiness; the crystals which floated in it when cold, fell down when heated; owing to its viscidity, it mixes with difficulty in cold, but dissolves readily in warm water. In contact with sulphuric acid, it acquires a deep brown colour, without emission of sulphurous acid: nitric acid decomposes it with production of nitrous vapours and formation of oxalic acid: muriatic acid did not seem to have any action upon it. Sub-acetate of lead and alcohol rendered it turbid, and precipitated a flocculent matter.

Six drachms of warm sirop were mixed with three ounces of alcohol, (distilled from grain,) of 35° of Baume's areometer; the mixture became turbid, and a white precipitate of flocculent matter subsided gradually; this precipitate was removed by filtration, and carefully washed with tepid alcohol. The alcoholic liquors were united and slowly evaporated at a heat of about 160.° When reduced to the crystallizable point the sirop had lost all its ropiness: carried to dryness it produced five drachms of very white sugar, impregnated with the smell of whiskey, and slightly contaminated with a little uncrystallizable sirop. After washing this sugar with alcohol, it was redissolved in distilled water, and the sirop, reduced to the crystallizable point, was entirely deprived of its former ropiness, and deposited, on cooling, a number of small crystals of pure sugar; what remained on the filter was found next morning to be a hard substance, much reduced in size, and weighing four grains only. This substance, examined with the glass, presented the following characters—it was of a red brown colour, shining and hornlike on the side exposed to the contact of the air; on the other side it appeared spongy, porous, and of a lighter colour: its sp. gr. was great. Thrown into boiling water, it did not dissolve, but became white, and considerably larger; it continued, however, to sink in water. This substance had many of the characters of gluten, but submitted to the action of the fire it did not evolve an ammoniacal odour; it burnt with a black smoke, and emitted an odour similar to lignia, leaving for residuum a piece of charcoal about one-fourth its former bulk; another piece withdrawn from the boiling water, and submitted to a gentle heat, gradually resumed its former bulk, hardness, and colour. Iodine had no action upon this substance, but hydrochloric acid dissolved it completely.

The brown sirop of 1830, was treated in the following manner—two ounces were dissolved in one ounce of boiling distilled water, and then mixed with six ounces of alcohol of 35°. The mixture became turbid, and a copious precipitate fell down; this precipitate separated from the alcohol, did not adhere to the fingers, and could be malaxated like warm molasses candy. This precipitate dissolved easily in boiling water, but sweetened it very little. A portion of it permitted to dry in the air, acquired a deep brown colour, shining at the surface, and spongy inside, of a sweetish taste, somewhat like the flesh of a dry raisin. Thrown upon an ignited coal, it swelled up, took fire, and burnt with the smoke and smell of a woody substance, but without emitting either an ammoniacal or burnt sugar smell.

The same filtered solution was then treated with sub-acetate of lead, which threw down a very copious precipitate; the liquid became considerably lighter in colour, and after being filtered, a stream of hydro-sulphuric acid was passed through it to precipitate the lead; it was filtered again, after ascertaining that it was entirely free from lead. The liquor now reddened litmus paper, but the acidity was soon removed by boiling. It was then evaporated to the consistence of a thick, transparent sirop, of the colour of light Madeira wine, which was set aside to crystallize, but did not, after remaining several days.

It may be inferred from the above experiments, that the difficulty experienced by Mr. Brasier in crystallizing his sirop of Seckel pear, was owing, principally, to a peculiar mucous substance which he did not separate sufficiently by the process he followed in his operation, and which rendered his sirop viscous and ropy. The sirop made in 1830, evidently contained a much greater portion of this mucilage than the other, and was, besides, as we learn, submitted to a very protracted action of heat, which is known to deprive solutions of sugar of the property of crystallizing. We have hardly any doubt that a better process than that resorted to by Mr. Brasier may be applied to the manufacture of sugar from the Seckel pear, and we are disposed to think that the employment of the sub-acetic of lead, instead of lime, for precipitating the vegetable, mucous, and colouring principle, will obtain the desired object. This means has already been proposed for the purification of cane and beet sugar, but as the salts of lead combine with sugar, and are separated from it with difficulty, it was abandoned. However, it is asserted in the Dictionnaire des Drogues, that some manufacturers have succeeded in this desideratum, and that this method will, before long, produce a great revolution in the art of sugar refining.

Now the question is, whether the manufacture of sugar from the Seckel pear may become an object of industry and of advantage to the country. The solution of this important question is yet beyond our reach ; our data, in reference to this point, are altogether insufficient, as we have no means of establishing a comparison between the quantity of sugar that two similar portions of land might afford, if cultivated, one with sugar cane, and the other with Seckel pear trees, nor between the relative costs of cultivation and manipulation. However, if we compare the richness of the juices of sugar canes, beet roots, and Seckel pears, we shall find that the last possesses a great superiority over the others. According to Mr. Gillmer, (Dictionnaire des Drogues,) Mr. Achard, a distinguished chemist, and a manufacturer of beet sugar, obtains four, to four and a half per cent. of sugar from the juice of red beets. Edwards, in his history of the West Indies, relates that the average quantity of sugar obtained from the juice of the cane, is about ten per cent.; now Mr. Brasier tells us that one gallon, or eight pounds of Seckel pear juice, yields two pounds of liquid sugar,* that is, 24 ounces of dry sugar, or 18.75 per cent., about twice as much as the juice of the cane. Thus if the assertion of Mr. B. be correct, which we confidently believe, a Seckel pear tree, producing four bushels of pears of 60 lbs. to the bushel, would yield three-fourths their weight of juice, or 180 lbs., which would produce 34 lbs. of dry sugar ; and one acre of ground, planted with 100 Seckel pear trees, each producing four bushels of fruit, will yield 3400 lbs. of dry sugar,† without preventing the soil from affording other agricultural products.

The genus Pyrus, (pear tree,) belongs to the class Icosandria, order Pentagynia of the artificial system of Linnæus, and to the family Rosaseæ of the natural order. It was divided by Linnæus in three divisions ; the Pyrus proper, *P. malus* and *P. Cydonia.* Persoon has separated the latter from the genus Pyrus, and formed a new genus under the name of Cydonia. From five species of Pyrus described by Persoon, the *P. communis* is the only one bearing fruit, which, by cultivation, is susceptible of becoming eatable.

In the natural state, the pear tree acquires considerable dimensions, and its branches are frequently terminated by long, straight, and hard, prickles; its fruit is acerb, hard, and its flesh granular. This single species has, by cultivation, produced a great number of varieties, which are propagated by grafting, and distinguished by difference in shape, size, and colour, and especially by the taste of the fruit. Tournefort arranged these different varieties into three different classes; the Summer, the Autumnal, and the Winter pears. The pear which is the subject of this report belongs to the second class. It is known by the name of Spicy, Musk, or Russet pear, and is called by the French *Rousselet de Rheims*.

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* One pound sugar, made up in sirop, gives one pint of the latter, weighing one pound five ounces avoirdupois.

† Each face of a square acre, containing 4840 square yards, is 69.6 yards long. or 208 feet. By leaving fourteen feet free from the edge of each of the faces of the square acre, to the first row of trees, and planting the trees at twenty feet distance from each other, it is found that one square acre will contain ten rows of ten trees each.

The Seckel pear derives its name from a gentleman of this city, who, it seems, was the first who paid particular attention to the fruit, and to spreading the tree among his friends and the public. However, Dr. D. Hossack, in an account of the Seckel pear, which was published in the third volume of the Transactions of the Horticultural Society of London, asserts, on the authority of a respectable friend, that seventy-two years ago, this pear was grown in the neighbourhood of this city, by a person of the name of Jacob Weiss, who had obtained the tree at a settlement of Swedes which was early established in the vicinity of Philadelphia, and that most probably Mr. Weiss, and the father, or grandfather, of Mr. Seckel were intimate, as both families were Germans, and of that rank in society which might be likely to lead to such an acquaintance. The conjecture therefore is, that under such circumstances, Mr. Seckel's family obtained the grafts from Mr. Weiss's tree; however this may be, Mr. Seckel deserves the credit of having propagated this delightful fruit, and having paid the greatest attention to the cultivation and melioration of the tree.

That the Seckel pear tree is a native variety of the neighbourhood of Philadelphia is incontestable, from the circumstance that it is hardly known out of the vicinity of this city, and because it has never been described by European horticulturists, except from the descriptions of our own authors, and as having been procured from this vicinity. There are already several sub-varieties, slightly differing in size, colour, and taste.

It is thus described by Mr. Cox, in his work on the fruit trees, published in this city in 1817. "The fruit is generally small, round at the blossom end, diminishing with a gentle swell towards the stem, which is rather short and thick; the skin is sometimes yellow, with a bright cheek, and smooth; at other times it is a perfect russet without any blush; the flesh is melting, juicy, and most exquisitely and delicately flavoured. The time of ripening is from the end of August to the middle of October. The tree is singularly vigorous and beautiful, of great regularity of growth, rich in foliage, and very hardy, possessing all the characteristics of a new variety, and, as a native tree, it is but little affected by that species of blight, commonly called fire blight, which, in this country, destroys so many pear trees of the imported varieties." A good representation of this fruit, copied from a drawing executed by Mr. Cox's daughter, has been appended to the account given by Dr. Hossack, and published in the Transactions of the London Horticultural Society.

The Seckel pear may be cultivated, and will flourish, on almost any species of soil; it should always be grafted or inoculated on the wild pear tree, as grafting on the quince tree subjects it to the same diseases with which this tree is generally affected in this country. It should be four or five years old when planted in the orchard, and each tree at a distance of from eighteen to twenty-five feet. Many horticulturalists whom we have consulted, prefer the smallest distance, or twenty feet at most, as by this method the trees protect each other from the wind, frost, sunbeams, &c.

It bears fruit at from five to six years old; at that age the product is trifling, but from eight to twelve years it increases considerably; when fifteen years old they are in full bearing, increasing, however, until they are twenty-five. Their average product, from fifteen to twenty-five or thirty years old, is variously reported, and there is generally one good and one bad year. The minimum product seems to be, on an average, four bushels of fruit.

It acquires considerable size, and lives forty, fifty, and as long as sixty years. The general experience is, that it is very little subject to the diseases afflicting other trees, more easy to cultivate, and bearing generally more fruit than any other.

Your committee have thus given as succinct an account as practicable to do justice to the subject, although they have extended their report far beyond the limits they had originally prescribed; yet they would do injustice to Mr. Brasier, as well as their own feelings, if in concluding the report, they omitted to say, that they consider him entitled to great praise for the talents, perseverance, and ingenuity he has evinced in the prosecution of the experiments, the results of which they have been examining, as well as those which have enabled him to saccharify, *directly*, rye, and other kinds of grain, the sweet and common potato, and other vegetable substances containing fecula, by means of the combined action of heat and water, acidulated by sulphuric acid, and afterwards to convert the liquid sugar thus obtained into alcohol,and cannot but believe that the ultimate results of them will prove highly important to the country.

E. Durand,
Jos. Scattergood.
[*Jour. Phila. College of Pharmacy.*

To the Editor of the Repertory of Patent Inventions.

Sir,—If the communication, which I send herewith, comprising "Observations on the preservation of lives from Shipwreck," &c. so far meet your approbation, and be so far consistent with the plan of your work as to obtain a place in its valuable pages, I shall probably trouble you again with a few thoughts on other subjects, and am,

Sir,
Your obedient servant,
E. H.

Bristol, September 6.

Observations on the preservation of Lives from Shipwreck, with a suggestion for the employment of Sky Rockets. By Edward Hodges, *Mus. D.*

The calamitous instances of the wholesale destruction of human lives by shipwreck, which have lately occurred, more especially the recent case of the loss of the Rothsay Castle, by which more than a hundred souls were hurried into eternity, have called the attention of most reflecting minds to the subject of the possibilities and probabilities of preservation from such disastrous accidents. Many have been the plans heretofore devised to carry into effect so humane and laudable an object; yet fresh instances of marine calamity are constantly calling forth other schemes, which perhaps attract attention for a little while, are acted upon probably in one or two instances, and then are heard of no more.

Still it is to be hoped that eventually some settled principles of action may be arrived at, and made generally known as well to those who plough the mighty deep as to the inhabitants of our coasts; principles of prevention, and principles of remedy, when danger threatens or direful accident takes place. As a contribution towards this desideratum, I will endeavour to suggest a few observations, some *one* of which may possibly hereafter conduce to the preservation of the life of a fellow subject, and if *but* one, my labour will meet with an ample reward.

With regard to the total prevention of shipwreck, it is evidently beyond the reach of human wisdom or foresight. Storms, tempests, and hurricanes, doubtless will continue to agitate the ocean; and whilst man shall continue to trust himself upon its bosom, he will ever be exposed to their occasionally fatal influence. But it does not therefore follow that he ought to neglect all precautionary measures—that he shall tempt the treacherous deep in a frail vessel, the certain prey of the first boisterous gale he may encounter—that he shall omit to provide himself with the most approved nautical apparatus—that he shall disregard the friendly admonitions of beacons and lighthouses, warning him of sunken rocks and hidden dangers—or that he shall despise even a landsman's well meant, although perhaps not technically expressed, hints for his farther security, from or during moments of impending destruction. Trusting then that my remarks may be received with good humour even by nautical men, I will venture to proceed.

The principal dangers to which a ship is exposed are three; fire, foundering at sea, and striking or running on shore; which last is what is most commonly understood by the term shipwreck.

With respect to the first and second of these, (as far as the second may be the result of *leakage*,) I offered some suggestions many years ago, to several mercantile gentlemen, who, however, denounced my idea as impracticable, because it would impede *stowage;* the stowage of a cargo being considered a matter of much greater importance than the safety of the passengers and crew. The plan perhaps was not likely to be *profitable*, and certainly would prove somewhat expensive, and, consequently, could not be expected to meet with even partial adoption. It was published in one of the provincial papers, and in consequence of the loss of the *Comet*, in 1825, was then again brought forward in the Bristol Mirror, in which its peculiar adaptation to *steam-boats* was especially pointed out. *It proposed the division of the hull laterally into three distinct holds or compartments, having no communication with each other.* The partitions were to be as substantial and water tight as the sides of the vessel, so that should the water gain access to one-third, the other two would preserve their buoyancy. This arrangement, it is evident, would be advantageously applied to ships engaged in the *corn* trade, or in carrying any other merchandise for the deterioration of which by damp, &c. the underwriters are not liable. In case of *fire* one part of the ship might be scuttled, or deluged, without injuring the next; besides the increased chance of *stifling* it in its origin: and in the event of bursting a boiler on board a steam vessel, such a provision would be found of no mean utility. There can be no valid reason assigned why such a proposal should not be acted upon with reference to those steam-boats which are constructed for the purpose of conveying *passengers* rather than *goods*. The anxiety and apprehension of the public having been generally roused by the late fearful death-dealing accidents, such a *safety boat* as is here recommended, would undoubtedly be preferred; and thus, for once, the love of money may be enlisted on the side of humanity.

People are frequently exposed to greater danger on board of steamers than those of which they are at all aware. I remember, some few years back, witnessing a circumstance which placed my own life, as well as the lives of forty or fifty others, in jeopardy. This happened on board a small steamer, which was then running in opposition to another, both designedly starting at the same time. A few minutes previously to starting, the steam being well up, I observed the man who acted as engineer, *placing additional weights upon the safety valve.* Not content with such small matters as were lying near at hand, he fetched a large iron spanner, weighing several pounds, and placed that also upon it; and it was not until I had suffered the infliction of some abusive language, and threatened not only to leave the vessel myself, but to alarm the other passengers, that I succeeded in inducing the heedless fellow to remove the obnoxious additions to the customary working-weight of the engine.

Such instances of murderous indiscretion are, it is to be hoped, rare; but the public will not much longer rest satisfied without something more than a mere *hope* that the engineer is not only an experienced, but a careful and trust-worthy man. They must also be thoroughly assured that the other officers are individuals not only of skill but of sobriety; and that the vessel itself is sea worthy, and properly manned and appointed. If no legislative enactment enforce this, (which is much to be wished, for the safety of his Majesty's lieges, and which assuredly would throw no obstacle in the way of the honourable exercise of the steam trade,) the prudential consideration of the public will eventually prevail; and perhaps after a few more Comets, and Frolics, and Rothsay Castles have been the means of engulfing fresh hecatombs of victims, the owners of such craft will find themselves under the necessity of certifying periodically, under competent authority, that their vessels and engines are in proper condition—that they have secured the services of skilful and prudent officers—and that they have provided all possible means of preserving lives in the event of unavoidable accident.

But after all the precautionary measures which ingenuity may suggest, or wisdom may devise, have been adopted, casualties will still occasionally occur, and the agonizing shrieks of shipwrecked men, women, and children will again be heard to mingle with the hideous roar of the midnight hurricane, and the awful under growl of the tumultuous Atlantic, as, in its "foaming fury," it beats against our iron-bound shores. This is the time for calling into activity every muscle of the body, and every energy of the soul; and accordingly we find that on such occasions individuals have ventured their lives, and performed feats of almost incredible heroism, in rescuing their fellow sufferers from a watery grave.

Life-boats, and various kinds of apparatus for projecting lines and ropes, have from time to time been invented, and happily, (when at hand,) have not unfrequently been the means, under Divine Providence, of saving many from destruction. Honour be to the inventors of such praiseworthy contrivances, amongst which I cannot but number the simple, yet highly promising method devised by Lieut. Cook, of converting a boat used for ordinary purposes into a life-boat, by means of a canvass deck, as described in the Repertory, No. 77, for August, 1831. But alas! in how many fatal instances have these appliances been wanting. How commonly do we hear of a wreck taking place at a part of the coast where no assistance was at hand—no friendly life-boat to take off the perishing sufferers—no Captain Manby's, or Mr. Murray's apparatus to effect a communication by means of a rope, even when the distance was practicable, and no sort of provision found on board for so lamentable a contingency. And in how many instances, even when at hand, do they unfortunately fail of success; in some, even augmenting the calamity by the fruitless sacrifice of lives engaged in the benevolent work. Thus frequently are all on board left to perish, saving, perhaps, one or two poor mariners, who reach the shore, scarce knowing how, wafted to some place of safety by the special favour of heaven.

The first grand desideratum in all such cases, is to get a line, or hawser, on shore. This matter once achieved, the daring activity and courageous self-possession of sailors quickly enable them to attain to terra-firma, and their ingenuity soon contrives, by the same means, to effect the deportation of those of their passengers who may not be endowed with the requisite strength and nerve to contribute in any material degree to their own rescue. Now it is obviously much more rational to provide a ship with *the means of throwing a line ashore*, should she chance to be stranded, than to trust to the uncertain possibility of an apparatus being provided on land; as she may strike on the coast of some desolate island, or be stranded on some barbarous shore, where all such contrivances are utterly unknown.

The plans proposed for effecting this desirable purpose are by no means so numerous as might have been expected. The first thought is that of carrying out a line by means of a boat; but probably the boat is swamped in the first or second attempt, and thus this hope is cut off. *Storm-kites* have been proposed, to be constructed upon the wreck, wherewith to waft a line with the grappling-iron attached. To say the least, such a species of manufacture is not likely to be efficiently executed under such circumstances. The ingenious Mr. Pocock has, in his patent kites, improved upon the idea, and rendered the scheme more practicable, by inventing a method of folding them up, so as to be enabled to keep large kites stowed in a very small space, and capable of flight after but a few minutes preparation. Besides this, their manageableness when mounted, and the tractability with which they may be raised or lowered, and veered right or left, eminently entitle them to the notice of nautical men, for this as well as for other services.

Captain Manby's apparatus, being somewhat cumbrous, not being serviceable on other occasions, besides being liable to the objection that the sudden velocity given to the shell frequently snaps the line, although now in use for some years, makes but little way towards a general adoption on board each individual ship. On land it will no doubt continue to be most effectively employed.

Mr. Murray's *arrow*, to be discharged with a line, from a musket, as being much more portable, seems to promise more universal utility; but it is liable to the objection that having no grapnel attached, it must be nearly confined to the service of throwing a line from the shore to the ship, not from the ship to the shore, unless indeed, in the latter case, friendly parties were at hand to assist by making it fast, or by hauling upon it, which evidently cannot be expected to be always the case even on our own island.

I know not whether the employment of the *sky rocket* on such occasions has ever been suggested or not, but it seems to me to be one of the most likely means of effecting a communication. A powerful rocket will carry with precision, to a great distance, a very considerable weight, and probably might be made to convey not only a small line, with a grappling iron attached, *but even a double line reeved through a block*, so as to enable the unfortunate parties on board to haul a stronger rope on shore without farther help. It will be necessary to attach a few yards of light chain to the rocket, so as to keep the line clear of the shower of fire to which it would otherwise be exposed; and then, I doubt not but that the rocket will prove as effective an instrument in the preservation of lives, as in other hands it has been rendered conducive to their destruction. The rocket would at the same time operate as a signal of distress.

If this suggestion be considered worth a trial, I leave it for those who may be more interested in the result than I am, and who are possessed of better means and opportunity to try the experiment. I only add, that I presume the chain must be attached about the centre of the stick, or between that point and the rocket; but this, actual experiment alone can determine.

Having thus started one idea, I pass on to make a few remarks upon the other means of saving endangered lives, by the employment of rafts, or floats, and by attaching to the person buoyant substances of divers kinds.

Sailors have long been justly celebrated for the expertness and despatch with which, under such untoward circumstances, as those that ordinarily attend the occurrence of shipwreck, they contrive and construct a raft; but they do not appear in such cases to have uniformly turned their empty water casks to the best possible account. True that a single empty cask, notwithstanding its buoyancy, forms a very untrustworthy support for a drowning man; it constantly eludes his grasp, and perhaps even hastens his destruction. But *two* casks lashed together would form an effective support to two or three individuals, who might thus be wafted on shore. A *series of casks* thus strung together would be still more serviceable, and although some few, perhaps many, of the parties trusting to them might be seriously injured, or even killed, by the violent collisions which might be expected occasionally to take place between them, yet the probability is, that the greater number could be saved.

The *cotton jackets* to be inflated with common air, which have lately been invented, seem to promise much, and I trust, will soon be brought into general use. But the material is so frail that it would certainly be preferable to make the jackets of the patent *air-tight cloth*, of which the inflated beds and cushions are constructed. This substance would be less likely to be rendered unserviceable by an accidental scratch or collision with any sharp or pointed body. Where would be the harm of requiring that every steam-boat should carry a number of these life-jackets, equal to the average number of passengers? Prudence, however, would dictate the propriety of each individual furnishing *himself* with a garment of this description, which might be made either in the shape of a waistcoat, or in that of a shooting jacket, and would be by no means an unsightly article of attire. It would be well if these life-preservers were made to consist of two, three, or more, separate air-cells, having no internal communication, and of course, therefore, to be separately inflated; when, in the event of damage or leak in one part, the remaining parts would still be sufficiently buoyant to float the body.

With respect to the management as applied to the case of ladies, there would seem to be more difficulty; but I doubt not but that, if their modesty be so great that they would not put on a man's jacket even to save their lives, their ready ingenuity will quickly contrive the way to manufacture a female life-preserver in the shape of some useful or elegant piece of dress, *e. g.* a cloak, or a spencer, or a pair of handsome *balloon sleeves,* and so the foolish vagaries of fickle fashion herself shall be rendered instrumental in the preservation of life. Let the ladies see to it.

But these things will be in some degree expensive, and beyond the means of the poor, who constitute by far the majority of steam travellers. What are they to do? Why, I recommend them to furnish themselves with a few *hogs bladders*, or the bladders of any other animal from a sheep upwards. Any man might with ease carry a dozen or more in his pocket, and if fastened in pairs with strong twine, he would upon emergency find them quickly available. With a pair attached to each arm, a man might float upon the waves for hours.

Had there been a basket or chest full of bladders on board of the Rothsay Castle, or the Frolic, how many valuable lives might have been saved! Had the steward of the former providently stocked himself with a good store of such commodities, instead of lashing himself and his hapless wife to the mast, and there in bitter and unavailing agony terminating his earthly career, the rational probability is, not only that both of them, and many of those who were involved in that terrific catastrophe, would have been saved, but that he in particular would have been *enriched by the adventure*, for assuredly he would have found no difficulty in disposing of his bladders *at any price*. Let all steam packet stewards then take the hint. Such a calamity may again occur, and in their own experience too; and in such an event they will find two or three guineas worth of hog's bladders a much more profitable speculation than a dozen hampers of porter, or ten thousand bottles of soda water. [*Rep. Pat. Inv.*

Power of Draught at different velocities, and on various kinds of Road.

TO THE EDITOR OF THE REPERTORY.

Sir,—Finding, upon conversation with a coach proprietor, that some very erroneous notions respecting the force required to draw a carriage under different circumstances, prevail amongst those persons who are immediately interested in being well informed on the subject, I am disposed to believe that the public generally, (with the exception of the scientific few,) are inoculated with the same errors, well knowing that it is usual to put implicit faith in what "practical men," (as they are called *par excellence*,) promulgate in their own particular avocation. It is almost universally said and admitted, that it requires less power to work a coach at a high than at a low velocity; and as this doctrine may lead some of your ingenious readers into very erroneous calculations, I am anxious to see introduced into your useful work, some account of the extensive series of experiments made by Mr. Macneil, (under the superintendence of Mr. Telford,) on the London and Liverpool road, in which the force of traction was very accurately ascertained by means of an improved dynamometer, invented by Mr. Macneil.

The general results of experiments made with a stage coach from London to Shrewsbury, a distance of 153¼ miles, on different inclinations, and at different velocities, are given in the annexed table:—

Rates of inclination.	Rates of travelling.	Force required.
1 in 20	6 miles per hour.	261
1 in 26	6	213
1 in 30	6	165
1 in 40	6	160
1 in 600	6	111
1 in 20	8	296
1 in 26	8	219
1 in 30	8	196
1 in 40	8	166
1 in 600	8	120
1 in 20	10	318
1 in 26	10	225
1 in 30	10	200
1 in 40	10	172
1 in 600	10	128

From the foregoing statement, it is evident that the power of draught required, constantly increases with the rate of velocity of the carriage, though apparently not always in a uniform ratio; owing most likely to the varying resistance even of the same piece of road in a different state of the weather.

Another piece of information furnished by Mr. Macneil's experiments, and inserted in Mr. Telford's report, I annex, as it appears to be of great practical value.

On a well made pavement, he found the force of the draught to be .	33 lbs.
On a broken stone surface, on old flint road	65 lbs.
On a gravel road	147 lbs.
On a broken stone road upon a rough pavement foundation	46 lbs.
On a broken stone surface upon a bottoming of concrete, formed of Parker's cement and gravel,	46 lbs.

Hoping, Mr. Editor, that you will deem this subject worthy of the consideration of your readers,

I remain,
Your constant reader,
James Green.

Wine Office-court, Fleet street, Oct. 3, 1831.

Remarks on the foregoing.

We entirely coincide with our correspondent in his estimation of the data he has obligingly furnished us from Mr. Telford's Report, though we do not take quite the same view of the opinion quoted of the coach proprietor, who appears to us either to have mistaken the true fact of the case, or to have misstated it. If he had said that "it requires a less *quantity* of power to work a coach *a given distance*, (or journey,) at a high velocity than at a low velocity, we think he would have been right, and that such will appear from the data, which Mr. Green has supplied us: we will, however, take leave, to place Mr. Macneil's table in a more convenient form for comparison and examination.

Rate of inclination.	Force required at 6 miles per hour.	Force required at 8 miles per hour.	Force required at 10 miles per hour.
1 in 20	268	296	318
1 in 26	213	219	225
1 in 30	165	196	200
1 in 40	160	166	172
1 in 600	111	120	128
	917	997	1043

The second and fourth lines of figures, (1 in 26 and 1 in 40,) present some discrepancies, which we do not know how to account for. In each of these cases, we observe the increase of force required at the several velocities, is just six pounds, while the increase in the first and third is far greater, and they all vary considerably. The safest way, therefore, to calculate from such data, is to take the total forces at each velocity, which is shown above in 917, 997, and 1043. From these we may conclude, that a given load, which requires to draw it a force of

9¼ lbs. at 6 miles per hour, will require
10 lbs. at 8 miles ———, and
10½ lbs. at 10 miles ———.

Or, we may say, that it requires about *an eighth* part more of power to increase the velocity from six to ten miles per hour; in return for which we have an increased velocity of motion of *four-tenths*, which is a saving of nearly *three-ninths*, (or one third,) in the quantity of power expended in conveying a given load the same distance.

Let us suppose a journey from London to York and back, which we will call 600 miles, (it is nearly,) for the convenience of calculation.

At 6 miles per hour it will take 100 hours.
At 10 miles - - 60 hours.
Therefore, 917 lbs. (total of 6 mile forces,) × 100 is 91,700
And 1043 lbs. (total of 10 mile forces,) × 60 is 62,580

Making a difference of force in favour of high velocity of 28,420 lbs.

Or nearly one-third, (three-ninths of 91,700,) as before mentioned; although it takes a *greater power during the same space of time* to draw at a high than at a low velocity: the gain being in the increase of space passed over by a given power in a given time. No advantage can, however, be taken of this circumstance, with carriages drawn by horses; as horses can exert but very little power of draught at high velocities, which makes it necessary to put four horses to run a coach load, that would require only one horse at a walking pace: and the walking horse, though drawing four times the load of each of the runners, and working three times longer, would be less fatigued at the end of the same journey. But in locomotive carriages the case is otherwise, as in them all the great advantages which result from a high velocity may be made available; and it will be mainly owing to this circumstance that locomotive carriages will ultimately supersede the use of draught horses on the common road. We are inclined to believe that in less than three years hence, this will take place in fast-going carriages for passengers and burthen, and that a more gradual amelioration and change to the same system, will take place in the slower going vehicles.

The reader to whom this subject is novel, should be mindful not to mistake the data we have used in our *comparative* estimate, for the real power required to draw a coach load; that being only about a sixth part. Mr. Macneil's statement, given by our correspondent, relates only to *ascending* inclinations; and as 111 lbs. is given as the force of draught in an inclination of one in 600, at six miles per hour, we may assume from all the data given with respect to the effect upon different kinds of road, that 100 lbs. will be about the average force of draught upon a level, and as the momentum acquired in descents will compensate for the loss of it in making ascents, 100 lbs. is probably very near the truth. Taking that for our datum, the following table will show the comparative quantities of power and draught expended in travelling 600 miles at the several velocities of motion:—

Ratio of velocity.		Time of journey.		Distance.	Force of draught.	Comparative quantity of power expended.
6 miles per hour	×	100 hours	=	600 miles	100 lbs.	100,00
7 miles - -	×	85+ -	=	600 - -	104 lbs.	88,40
8 miles - -	×	75 - -	=	600 - -	107 lbs.	80,25
9 miles - -	×	66 - -	=	600 - -	110 lbs.	72,60
10 miles - -	×	60 - -	=	600 - -	113 lbs.	67,80

[*Reg. of Arts.*

Theoretical and Experimental Researches to ascertain the Strength and best Forms of Iron Beams, by EATON HODGKINSON.[*]

From the Memoirs of the Literary and Philosophical Society of Manchester, 1831.

"1. THE very frequent use of iron beams for supporting the floors of factories, and of other places crowded with people, renders it extremely desirable that the best information should be obtained with respect to the strength of this material, in order to insure, without a great superfluity of metal, the requisite stability. In a case so deeply involving the loss of life, and where a failure would be attended with such serious consequences, hardly too much research can be applied. The scientific character of the subject also imparts to it additional interest; and we cannot, therefore, be surprised, that the strength of materials has engaged the attention of many of the most distinguished philosophers from the time of Galileo, who was the parent of these inquiries, to the present age; including the names of Bernoulli, Euler, Lagrange, Coulomb, and Robison.

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[*] We are indebted for the use of the work forming the subject of the following article, to our esteemed friend William Strickland, Esq., Architect. We purpose to make such extracts from it as will put our readers in possession of the valuable information which it contains; giving as much attention to the theoretical part of the work as will be necessary to present a correct view of its bearing upon the experimental researches.—COM. PUB.

"These great men have shown in its different departments, how the refinements of speculative science can be applied to practical purposes. They have done much—but owing perhaps to a disinclination to the labour and expense of making sufficient experiments, much was left undone for later inquirers. And in the lateral strength of bodies, after all the hypotheses that have been employed upon it, the practical man has been till lately without a general and satisfactory theory.

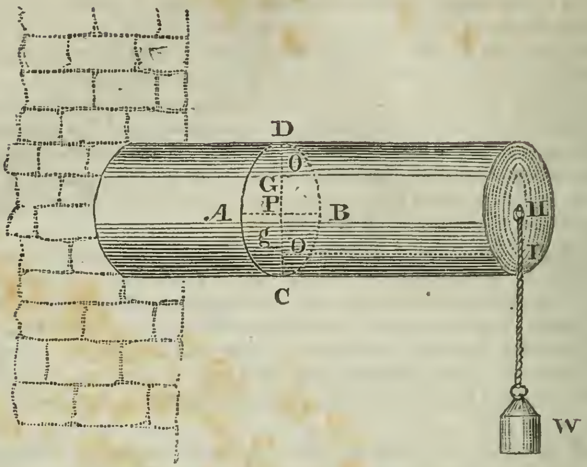
"2. But, while it is thus necessary to insure sufficient strength, it is very desirable that the beams should be formed in the manner best adapted to resist the strains to which they are subjected: and if, by an alteration from the usual shape, the same strength could be obtained with a smaller quantity of metal, the expense would be reduced; and the material rendered even capable of bearing more pressure, by having less to support in its own weight. It may be stated in illustration of this remark, that there are usually upwards of 100 tons of metal in the beams supporting the floors of a factory.

"3. To attain these objects, as far as lay in the power of the author of this paper, a number of experiments have been made; but before giving an account of them, it may be proper to describe the nature of the strain to which bodies thus acted upon are exposed."

"4. Suppose a beam, placed horizontally, with one end firmly fixed in a wall, and a weight hung at the other, it will bend: but, it is evident, this could not take place, except by the lengthening of the top parts, or the compression of the bottom, or by both. Now, both of these effects do actually take place; and hence, there is some intermediate point, or line, between the top and bottom of the beam, where the particles are neither extended nor compressed: all above being in some state of tension, and all below compressed. This line may properly be called the neutral line.

"If then, ADBC represent a transverse surface of the beam, and AB the neutral line, ADB must be the surface of tension and ACB that of compression.

Fig. 1.



"Now, it is evident, that the extensions or compressions of any particles within these surfaces, will be as their distances from the line AB; and the forces, exerted by those particles, must be in the same proportion, so long as the elasticity remains perfect; for then the forces are found to be as the extensions or compressions."

Afterwards the forces of the particles would vary in some different ratio of the distance.

The fact that the forces of the particles on each side of the neutral line are equal, furnishes a method of determining the position of that line.

The force of each particle in the surface of tension is represented by the product of that particle into its distance from the neutral line AB. The sum of the forces of the particles in the surface ADB, of tension, will give the force of tension produced by the weight W. By a well known property of the centre of gravity, viz. that it is the centre of mean distance, the sum of the particles in the surface ADB multiplied by their respective distances, may be represented by the surface ADB, multiplied by the distance of its centre of gravity, G, from the axis AB; that is, by the surface ADB multiplied by GP, (ADB × GP.)

In like manner, the force of compression, produced by the weight W, in the surface ACB, may be represented by the surface ACB multiplied by gP, (ACB × gP,) g being the centre of gravity of the surface of compression ACB.

If the resistance of the solid to extension be equal to its resistance to compression, then the two products found above will be equal. This, it appears by experiment, is nearly the case in cast and in wrought iron, but is not so, (according to some experiments made by our author,) in timber.

In general, then, the products found above to represent the forces of tension and compression, cannot be taken as equal, but we have always the proportion, as

*ADB × GP : ACB × gP : : force of extension : force of compression.

We see from this that the neutral line divides the surface of fracture, so that the parts multiplied by the distances of their centres of gravity from the neutral line, are in a constant ratio.

In the cases of cast and malleable iron, as stated above, the ratio is that of equality, or

$$\mathrm{ADB} \times \mathrm{GP} = \mathrm{ACB} \times g\mathrm{P}.$$

If we suppose these products equal in a homogeneous beam of a circular, or rectangular, section, the surfaces ADB and ACB must be equal, that is, the neutral line bisects the section.

Thus much for the means of determining the position of the neutral axis.

If we would consider the total effect produced by the weight W, we should observe that it tends to turn the particles in ADB by tension, about the neutral line AB, and also those in ACB by compression, about the same neutral line. If we suppose the resultant of all the forces of tension to pass through O, the effect of tension around the axis AB will be represented by the sum of the tensions of the particles in ADB multiplied by the distance OP. If, in like manner, we take o for the point through which the resultant of compression passes, the effort to turn about AB by compression will be measured by the sum of the compressions of the particles multiplied by oP. But the weight W acts with the leverage of the length of the beam to the surface of fracture, that is, with oI; whence its effect is measured by W, multiplied by oI. This last effort being equal to the sum of the two former, we have

$$\mathrm{W} \times o\mathrm{I} = \mathrm{OP} \times \text{sum of tensions of particles} + \text{sum of compressions} \times o\mathrm{P}.$$

We have before seen that the sum of the forces of tension and of compression on each side of the neutral line, are equal, whence one may be substituted for the other, and our equation becomes,

$$\mathrm{W} \times o\mathrm{I} = \text{sum of tensions} \times (\mathrm{OP} + o\mathrm{P}) \text{ or}$$

$$\dagger\,\mathrm{W} \times o\mathrm{I} = \text{sum of tensions} \times \mathrm{O}o$$

Whence we see that other things being the same, the weight at H, to produce a given deflection, will depend upon the distance Oo.

In the conditions employed to determine the points O and o, we recognise those for the centre of percussion of a body; accordingly O and o may be found by the rules given for that centre, when the position of the neutral axis has been found.

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* Calling the surface ADB $= s$, GP $= g$, ACB $= s'$, gP $= g'$, the ratio of the force necessary to produce extension to that required to produce an equal compression, as $1:n$; the equation of our author corresponding to the above proportion is $gs = n\,g's'$. This is obtained by a method which we consider less simple than that given above.

In the case of timber, according to Mr. Hodgkinson's experiments, $n = \frac{4}{5}$.

† To find an absolute value for W, call PD $= a$; the weight sustained by the tension of any number of fibres at the top of the beam $= t$. Then since t is the force of tension at the distance a from the neutral line, $\frac{t}{a} \times x$ will be the force at

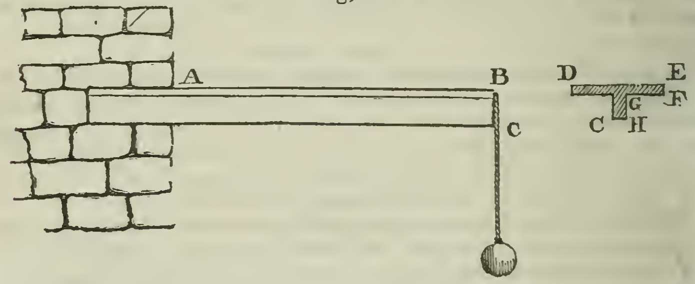
We at once perceive the influence of the form of a beam upon its strength, and that in finding the form of greatest strength we must be guided by the results just obtained. Thus, since the weight to produce a given deflection depends upon the distance O*o*, we must seek to remove as far from each other as possible the points O and *o*, the centres of tension and compression. These points corresponding to the centres of percussion of the two parts into which the section of fracture is divided by the neutral line.

We shall have occasion to refer to these remarks in the sequel. The theory applies so long as the elasticity of the material of which the strength is to be determined, remains unimpaired.

We pass over the very ingenious experimental demonstration of the equality of forces on each side of the neutral line, made by the substitution of springs for the natural elasticity of the particles of solids, and proceed to the author's examination of the relation between the resistance of cast iron to extension and to compression.

"For this purpose, I had several castings moulded of different sizes, but of one general form, such that by bending them, first one way, and then the other, the relative resistances to extension and compression in one and the same part might be obtained. Each casting was several feet long, and equal in section throughout, with its parts as slender as could well be run to preserve it even and sound. During the experiment one end of the casting was fixed in a wall, and weights to bend it hung at the other.

Fig, 2.



any distance x, and that at the mean distance (GP$=g$) will be $\frac{t}{a} \times g$: hence the force of tension of all the particles in ADB ($=s$) will be expressed by $\frac{t}{a} \times g \times s$. Substituting this value in the equation just found, and calling l the length of the beam, we have $wl = \frac{tgs}{a}(p + p'.)$

To comprehend the case in which the beam is bent, the bearing length being altered by deflection l, becomes $l \times$ Cosine of deflection. The formula, calling D the angle of deflection, is $wl \times \text{Cos. D} = \frac{tgs}{a}(p + p'.)$

Both of these equations are from the text, the method only differing from that of the author.

"ABC represents an elevation of the castings, and DCHE a cross section of all of them. The end A was wedged fast into the wall, but so as to be easily removed, in order that the casting might be turned the other side upward; as the intention was alternately to compress and extend the vertical rib of DCHE at C."

Following this method four series of experiments were made, each one consisting of a set with the vertical rib alternately downward and upward. The dimensions of the beams in series one, two, and four, were different; in series two and three nearly the same, having been cast from the same model.

The dimensions of the bar used in the series four are given, to enable the reader to judge of the scale upon which these experiments were made, and because the same dimensions were used in an experiment of a different kind subsequently made.

"Expert. 4.—Length of arm five feet—deflections taken at the end —weights hung at four feet six inches from shoulder—weight of casting at the end with scale $10\frac{1}{2} + 4\frac{1}{2} = 15$ lbs., DE $= 4.1$ inches, EF $= .25$, GH $= 1.1$, CH $= .25$."

"18. The experiments were mostly begun with the broad part of the casting upwards, to compress the vertical rib; and when a weight or two had been laid on, and the deflections noted, the piece was turned the other way up, before the elasticity was much injured, and the deflections from the same weights again taken, the rib being now extended. This mode of turning the piece, which was usually done two or three times with the same casting, it being first reduced, if necessary to its original form, answered better for obtaining the comparative extensions and compressions by equal weights, than making all the experiments on each side in a series would have done; though it left the tabular results rather more anomalous. I preferred, too, obtaining the extensions and compressions from the same rib, to taking each from different ones, on account of the difficulty of getting such small castings precisely of equal size and equal strength of iron. This mode of making the experiment, however, rendered the time when the elasticity became impaired rather doubtful."

The results are collected in the following table given by the author:—

Expts.	Weights in lbs.	Deflections from extension.	Deflections from compression.	
1st.	7	.37	.34	Earlier weights.
2nd.	30	.61½	.53	
3d.	30	.96	.97½	
4th.	30	.86	.84	
1st.	27	1.56	1.35	Later weights.
2nd.	80	1.65	1.63	
3d.	50	1.72	1.67	
4th.	60	2.03	1.86	

"19. With regard to the inferences to be drawn from these experiments, we will make the three following suppositions:—

"1st. Suppose the material to be incompressible, as has generally been assumed in this country, and the experiment to be begun with the back of the casting upwards, the leg GC will, by supposition, offer an insuperable resistance to a force tending to compress it, and the deflection must arise from the small quantity which the broad part DEF will extend: if the casting be then turned the other side upwards, the part DEF being incompressible, the deflection must arise from the extension of GC, and consequently would be many times as great as when the casting was the other side upwards, GC being so much less than DEF.

"2nd. Suppose the body to be inextensible, then if the back of the casting be upwards, the deflection will wholly arise from the compression of GC, and will be many times greater than if GC had been upwards, when it must have arisen from the compression of DEF.

"3d. Suppose the extensions to be equal to the compressions from the same forces; the deflection in this case will be the same from the same force whether the rib GC be downwards or upwards."

"The table of results shows that the first and second suppositions are inadmissible; with regard to the third, it appears that in every instance, except one, the deflections from extension are greater than those from compression by equal forces, whether the elasticity be perfect or not; the first four having been taken before the elasticity could have been much injured, and the last four nearly at the breaking point. Still the difference is not so great, but that they may, in most cases, without material error, be assumed as the same. Hence, the extensions and compressions from equal forces in cast iron, are nearly equal.

"21. This is a very interesting fact: it has often been assumed by writers, but I have not before seen any proof of it, except in an experiment of M. Duleau, which renders it very probable that it is the case in malleable iron. Mr. Tredgold, in his "Essay on the Strength of Cast Iron," has assumed it, and made it the basis of his reasonings. He thence concludes, (Section 4th,) that in a beam of the strongest form, its section ought to have equal ribs at top and bottom of it: so that the neutral axis being at half the height of the beam, there might be equal resisting powers on both sides of that axis. Another conclusion which might be drawn in the same way, and which he mentions, (page 132,) is, that a triangular prism, [he might from his view have said any other form,] is equally strong, whether it be loaded one way up or the opposite, supposing it not strained, so as to injure its elasticity."

[TO BE CONTINUED.]

Improvement in Piano Fortes.

Monsieur Pape has just succeeded in improving the mechanism of the piano forte in a way that merits attention.

It has for some years been acknowledged by skilful practitioners, that if the wires of this instrument could be struck by the hammers from above, instead of from below, that a finer quality of tone, more power, more solidity, and a longer duration as to correctness of intonation would be accomplished. By dint of perseverance and a variety of experiments, Monsieur Pape has triumphed over all his difficulties; and this new piece of mechanism, carried to the highest degree of perfection, is one of the most remarkable improvements in piano fortes that have been invented since the origin of that instrument.

Monsieur Pape, in applying his discovery to horizontal grand pianos, has found the means of considerably diminishing their length, and at the same time of augmenting the volume of tone. The tone of these new horizontal pianos having made it desirable that the same mechanism should be adapted to those of the square form, he made fresh experiments, and the success of them surpassed his expectations; for in reducing his scale to less dimensions than those now in use, not only has he obtained an easier, more nervous, and more delicate touch, but a volume and quality of tone as powerful as in instruments of the ordinary length.*—*Archives des découvertes.*

⁂ The principle of making the hammer strike the wires from above is by no means a new invention: unless we are greatly mistaken it has been used in Germany many years. That "a finer quality of tone, more *power*, and more solidity" may be obtained by this new application, we can readily conceive; how the principle, however, should affect the "*duration* as well as the correctness of the intonation," we can by no means understand, being ignorant of Monsieur Pape's mechanism.

That with "diminishing the length, he should augment the volume of tone," too, is a very remarkable fact, and which we can scarcely credit without the aid of those two important faculties, the senses of hearing and seeing. As an improvement, however, in an elegant art, it is very valuable in every point of view; for we consider this most common of all musical instruments capable of considerable amelioration as to touch, tone, (quality as well as quantity,) and serviceable duration; for of all organs it is the earliest and the most sensibly affected by use and age. *Editor Repertory.*

Improvement in Rail-ways and Carriages at Coal Works.

In this valuable improvement the rail-way is sustained in a level and horizontal position, and at the required height, by a suitable number of upright posts, and permanently secured by bolts or other fixtures. The posts are securely imbedded in the ground, and are preserved in their respective positions by suitable bracings or stancheons. On the horizontal bars which constitute the bed pieces of the rail-way, are beds of wrought or cast iron, or other proper ma-

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[*] See Loud's patent for this improvement in the Franklin Journal, for July, 1827.

terial, which are firmly secured to them, and extend their whole length. These beds are smooth and level to receive the wheels of the carriage, which may be flanched or grooved to move upon them. The rail-carriage consists of a frame, constructed of suitable material, to which axles of wrought iron are attached by means of bolts, or other contrivances. The wheels may be formed of wrought or cast iron, or other proper substance, and may be made solid or otherwise, with their surfaces flanched or grooved to move on corresponding surfaces of the beds of the rail-way. Attached to the bottom of the carriage, and suspended from it, is a chain, which may be lengthened or shortened at pleasure, having a hook at its extremity for attaching a coal tub. At one extremity of the rail-way is a crane, secured by suitable fixtures. This crane is supplied with a chain or rope fall, which raises the coal from the vessel to the carriages, and which may be worked by horse or other power. Beneath the rail-way, and under this crane, is a staying made to slide between the foot, and may be raised or depressed by means of pins or bolts which fit into apertures bored in the posts. The coal is raised to the staying before mentioned in tubs by a chain fall attached to the crane, where it is disengaged by an assistant, and transferred to the carriage. The carriage is pūt in motion by means of ropes, pulleys, or other machinery, and the coal, suspended in tubs beneath, is transported to the distance required, where it is deposited, the carriage immediately returning with the empty tub. This improved rail-way is of a double form, so as to admit of two carriages moving parallel to each other, when the middle horizontal bed piece has on its surface beds for the inner wheels of both carriages. In this case the crane is placed in the centre, and is enabled to serve each carriage in succession by swinging two ways.—*New Monthly Mag.*

Strength Test for Bleaching Powder.

The necessity of having a means of ascertaining the chlorine strength of bleaching powder has been felt so strongly, that many persons have turned their attention to the discovery of an unexceptionable process for the purpose; and the use of sulphate of indigo, of salts of manganese, and of the chlorometer apparatus of Gay Lussac, is consequently well known to all who are concerned in the use of that chemical production. M. Marozeau, amongst others, has sought to obviate the objections belonging to all the processes known, and has described, as the result of his exertions, a new process founded on the use of mercurial salts. Let muriatic acid be added to a solution of protonitrate of mercury, in quantity more than sufficient to precipitate all the mercury as calomel; then let a solution of chloride of lime be added: the chlorine set at liberty by the excess of acid will react on the calomel, will convert it into corrosive sublimate, which, dissolving, the solution will become perfectly clear and transparent again, if enough chloride of lime has been added.

This effect, when produced by known solutions of mercury and bleaching powder, and with the attention required to obtain a complete chemical action, is said by M. Marozeau to furnish a very excellent method of ascertaining the strength of bleaching powder; for by agitation of the liquids, all the calomel at first formed may be converted into corrosive sublimate, and dissolved before the slightest odour of chlorine is sensible in the residual liquor. He uses the chlorometer of Gay Lussac, but inverts the office of the pipette or fixed measure of bulk: instead of using it to measure out the bulk of solution of chlorine to be tried, it is employed to measure out a fixed quantity of the test solution of nitrate of mercury, and the graduated jar is used to ascertain the quantity of solution of chloride required to convert the calomel when formed into corrosive sublimate.

The strengths of the solutions of nitrate of mercury and bleaching powder to be tried, are made to conform to the dimensions of the instruments constituting Gay Lussac's chlorometer. The proof liquor is procured by boiling mercury in excess in dilute nitric acid, continuing the ebullition until no deutonitrate remains in solution. The strength is adjusted in two ways, either by preparing a solution of chloride of lime with a known quantity of chlorine, and then trying it against the test solution as yet unadjusted, and diluting the latter until it agrees with this known solution,—or by ascertaining how much of the test liquor is required to precipitate the whole of the chlorine in a known solution of common salt. For, as the quantity of chlorine in common salt required to convert the mercury in a given quantity of test solution into calomel, is exactly equal to that required afterwards from chloride of lime to convert the calomel, so formed, into corrosive sublimate, it is easy to make a known solution of salt, and to dilute the test liquor, until a given quantity of it will exactly precipitate a measure of that saline solution; and such test liquor will, by the process recommended, show what quantity of the solution of bleaching powder contains the same proportion of chlorine as the standard solution of salt thus referred to.

M. Marozeau then gives minute instructions for the use of this process, intended for those who, not possessing much chemical knowledge, still have to apply the instrument; and he states that, having used it very constantly, it has afforded him highly satisfactory results.* [*Jour. Royal Institution.*

Round Sterns to Ships of War.

The important question of round sterns has with much generality been discussed; and it is therefore with no ordinary pleasure that we find a splendid prize has been offered by the French Minister of Marine, for determining among all the forms that can be presented that particular one which shall unite in the highest degree all the requisite conditions that the seaman, the naval architect, and the geometrician may require.

Our readers are aware that a vigorous contest was for a long time kept up respecting the *principle* of the round sterns; but time, which softens differences, and moulds even prejudice itself into the form of truth, has, in this case, obtained another victory; and a figure which our gallant seamen had connected with the glorious recollections of Trafalgar and the Nile, is now—with wisdom which cannot be too highly praised—nearly, if not altogether, abandoned. The square stern, with all its massy and cumbrous forms, has indeed given way to another more in unison with the great march of improvement now going on.

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* Ann. de Chim., xlvi. 400.

But while the principle of what is commonly called the round stern has, with few exceptions, been admitted in all its fulness, its best possible form has not been determined; and it would seem as if fancy, rather than the sound discretion which geometry imparts, had presided over the designs hitherto submitted to the world.

Among the infinite variety of forms which may be denominated "round," there must be one which shall unite in a higher degree than any other, all the best conditions of strength, convenience, and defence;—which shall secure to the brave sailor the greatest degree of comfort, add a new arm to his power in the day of battle, and secure to that portion of the frame work of the vessel, the same admirable strength as distinguishes its other parts. It is this choice of forms, which the French Minister of Marine now invites the naval architect, the sailor, and the man of science, to contemplate; and we hail the call as a revival of the days when the great men of the Academy of Sciences, clad in the armour of the transcendental geometry, descended from the lofty elevation of the system of the world, to contend for the conditions of the metacentre, the great principles of stowage, the problems of masting, of pitching, and of rolling, and all the other complicated but interesting inquiries, which the general question of ship-building involves.

Our *Journal*, read alike by geometricians, the naval architect, and the sailor, can hardly be better employed than in recording the conditions which the French minister has proposed for this great problem.

"To furnish the best plans for the circular sterns for line of battle ships and frigates, with all the exterior and interior fittings, the manner of disposing the timbering so as to combine the necessary conditions for defence, with strength, lightness, a dispersion of the weight in proper proportion to the displacement of each part, the efficiency of the rudder, the convenience of the water-closets, and the general suitableness of the accommodations.

"This manner of fitting the stern must possess facilities for enabling the commandant to be aware of whatever manœuvres may be in progress, without being obliged to appear on deck.

"The style of ornament which it would be proper to adopt, as well for the forward as for the after part of these new constructions, is also to be described. The competitors are to remember that nothing of importance is to be at all sacrificed to these decorations.

"The side of the ship at the stern must have the same thickness as at the corresponding places in other parts of the ship. The ports must be so disposed, that it may be easy, on each deck, to bring guns to bear right aft, and on the angles of the quarters, to command those points which the other guns cannot be brought to bear upon.

"The rudder may be fitted either without board or within with a circular head, but reasons must be given for whatever plan may be proposed. Reasons also are to be stated for the station which may be proposed for the water closets, whether they are fitted interiorly, or in an exterior gallery.

"The officers of the different branches of the naval service are called upon to send their proposals to the minister before the 1st of July, 1832. Other persons wishing to become competitors, are eligible to do so.

"The memoir in which each competitor explains his proposals, must be accompanied with all the calculations and drawings which may be necessary to render his plan perfectly complete and intelligible in all its details.

"Each proposal must have a motto affixed to it, of which a copy is to be enclosed in a sealed letter, containing also the name and place of residence of the proposer.

"A medal of the value of 2000 francs will be given to the author of the best memoir presented to the minister of marine before the stated period. [*Brewster's Jour.*

On Artesian, or overflowing, Wells, and the employment of the Warm Water brought from great depths for economical purposes.

From the Edinburgh New Philosophical Journal.

Whence do artesian wells derive their water, and how do they acquire their power of ascension, which sometimes occasions in the middle of plains, at a distance from hills and mountains, the surprising phenomenon of spouting springs? are questions which have been often proposed, and very variously answered. The most natural explanation is undoubtedly that which supposes the water of these wells, like that of natural wells, to be derived from the atmosphere, and their power of ascension the hydrostatic pressure of a more elevated reservoir, with which the perforated canal or bore stands in connexion. Sometimes, however, the local relations are such that it is difficult to refer the water to such a source, and then it is that the framers of wild hypotheses stand forth with their absurdities. A late observation, which affords a striking proof of the accuracy of the above explanation, is therefore the more worthy of being noticed.

At Tours, on the Loire, an artesian well, with a bore of three and three-quarter inches, which brought the water from a depth of 335 feet to the surface, was damaged, and they were obliged, (on the 30th of January of this present year,) to remove the tube till within twelve feet of the surface. The water suddenly rushed out, increased fully to a third more than its former quantity, and continued to flow for several hours. It was now no longer clear as before; on the contrary, it brought along with it a great quantity of fine sand, and surprising enough, also numerous remains of plants and bivalve shells; branches of the thorn several inches long, and blackened, owing to their residence in the water; further, fresh stems and roots of marsh plants, seeds of many different plants, and also fresh water shells, as *Planorbis marginatus*, also *Helix rotundata*, and *Helix striata.* All these resembled those which are found after floods, on the sides of smaller rivers and brooks. The fact is so remarkable, that the truth of it might be called in question, had it not been accurately determined. There result from it the following conclusions:

1. The water of the artesian well of the city of Tours must occupy not more than four months in flowing through its subterranean canals, because the ripe seeds of harvest have reached the mouth of the well without being decomposed.

2. As the water carries along with it shells and pieces of wood, it cannot reach its place by filtration through the layers of sand, but must have flowed through more or less irregular canals.

3. The source of this water is to be looked for in some moist valleys of Auvergne and the Vivarais.

The remains of the plants and animals are deposited in the mineral cabinet of the city. As soon as the seeds, five or six in number, are referred to their plants, naturalists will, in places situated higher than the basin of the Loire, be able to make out the points where these subterranean waters are poured out.

It is to be wished that French observers would state how they prove that the waters of this well come from Auvergne, about 130 miles distant. If this shall be proved, the considerable rise of artesian water in other places, where no hills occur near, or where they are bored in the most elevated points in the neighbourhood, will lose every thing puzzling.

This rising is sufficiently remarkable to induce us to communicate some examples from Hericart.

Name of the Well.	Depth of the well from the surface of the place.	Height of the rise above the level of the Seine, at the Point de la Tournelle.
	Paris feet.	Paris feet.
St. Owen - -	150.8	6.2
Same - - -	203.2	11.1
Epinay - -	166.2	24.6
Same - - -	207.8	33.8
Maison Blanche near Paris -	121.6	64.6
Mount Rouge at Paris -	315.5	80.0

The two last wells, exactly those which rise highest above the level of the Seine, are bored on heights, and hence their water remains considerably under the surface of the earth; also in both the deepest of the bore-holes is still above the level of the Seine, in the first seven metres, in the last about one metre.

In the work of Hericart, a fact is mentioned, which confirms the view of artesian wells already given. Gulfs, in which rivers and rivulets lose themselves, are very frequent in the Jura, and other similar limestone mountains, and there, where the uppermost bed consists of a clayey soil, which opposes the sinking down of the rain, sometimes proves very beneficial in agricultural operations, by carrying away the superfluous water. In some places, M. Hericart remarks, man has imitated this example set by nature with great effect. The draining of the plain of Palans, near to Marseilles, is an example of this. This plain, which is at present covered with beautiful vineyards, was formerly a great marshy basin, without outlet. It was drained by means of great sink holes, which were sunk down to the underlaying porous or cavernous stone, and were connected together by means of a number of ditches or drains. The water which was carried away by these shafts, reached, by means of subterranean canals, the harbours of Mion, near to Cassis, where it appeared again as spouting springs. Here, therefore, man, without intending it, made artesian wells, not for the purpose of obtaining water, but in order to get clear of it.

The following report, published by M. Bruckmann Kongl, Wurtemburg Baurath, in the *Ver handlungen zur Beforderung des Gewerbfleisses in Preussen*, 1830, Lieferung, No. 4, affords a striking proof how varied the uses are of artesian wells. M. Bruckmann caused to be bored, under his inspection, from August 1827, to December 1829, at Heilbronn, five bore holes for fresh water, in order to obtain the necessary quantity of pure water for the purposes of two paper mills and a flax spinning mill. Two of the bore holes were sunk to a depth of sixty feet, one to ninety, another to 100 feet, and one to 112 feet under the lowest level of the Neckar. In all of them the water rose eight feet above the level of the Neckar, and on an average each delivered from forty to fifty cubic feet. The purpose of the borings was perfectly accomplished, even to overflow; but the discovery was made that the water of all the bore holes had constantly a temperature of 54.5 Fah. This fact led M. Bruckmann to a very important application of this water, viz. heating the mills with it. The paper mill contained 72,000 cubic feet, a working hall over it 10,800 cubic feet. Both spaces, which contained together 82,800 cubic feet, were the whole winter, 1829–1830, through, warmed by this water alone to a temperature of 45°.5 Fah. and 47°.7 Fah. and when without, the temperature was 24.2 Fah. The thermometer in the mills did not sink lower than 41° Fah. even when the doors were kept open. Every miller knows well how much labour, time and expense it occasions in hard winters to heat daily, and even in a scanty manner, the water wheels, and with what risk of life it is attended. It was reserved for Mr. Bruckmann, by means of artesian water, to free his water mills from this burdensome evil. He conducted the running water from the Hollander, which still possessed a temperature of 52°.2 Fah., through tubes into the Wassergasse, and had thus the satisfaction to find that his water wheels, the whole winter through, even when the external temperature was as low as 24°.2 Fah. never froze.*—*Poggendorf's Annalen, H. ii.* 1831.

Meteorological Observations for February, 1832.

Moon.	Days.	Therm.		Barometer.		Dew point	Wind.		Water fallen in rain.	State of the weather, and Remarks.
		Sun rise.	2 P.M.	Sun rise.	2 P.M.		Direction.	Force.		
				Inches	Inches.				Inches.	
⊗	1	25°	33°	30.15	30.25	26	W. SE.	Moderate.		Clear day.
	2	34	41	30.04	30.00	36	SW.	do.		Cloudy day.
	3	40	56	30 00	30.00	47	SW.	do.		Clear—cloudy.
	4	48	41	30.24	30.24	42	NW. NE.	do.		Cloudy day.
	5	32	32	30.10	29.30	25	NE. NW.	do.	.75	Rain—snow.
	6	21	30	29.30	30.20	10	NE. E.	do.		Clear—cloudy.
	7	29	39	29.90	30.00	13	W. NE.	do.		Cloudy day.
	8	26	29	30.20	30.20	26	SE .E.	do.	.90	Sleet and snow.
☽	9	23	32	30.00	29.85	27	SE.	do.	.60	Cloudy—rain.
	10	32	32	29.90	30.10	29	W.	do.		Cloudy—trees loaded with
.	11	28	32	30.25	30.20	38	SE.	do.		Clear—cloudy {ice.
	12	45	56	29.70	30.60	54	S.	Blustering.	.11	Rain in the night.
	13	34	35	30.00	30.10	19	W.	do.	.20	Cloudy—rain.
	14	30	36	30.30	30 30	27	SE.	Moderate.		Flying clouds—clear.
☉	15	32	42	30.20	30.30	37	W.	do.	.5	Snow—flying clouds.
	16	29	32	30.40	29.84	24	SW.	do.		Drizzle--fly'g cl'ds. rain &
	17	16	26	29.90	29.80	11	W.	do.	.20	Cloudy day. { snow at nt.
	18	36	54	29.80	29.70	45	SW. W.	do.		Cloudy day.
	19	49	65	29.60	29.55	54	SW.	do.		Clear—cloudy.
	20	50	40	29.55	29.55	40	N.NW.	do.		Cloudy—flying clouds.
	21	19	22	29.80	29.94	9	W.	Blustering.	.56	Cloudy day.
	22	16	34	30.30	30.40	14	SW.	Moderate.	.19	Rain—cloudy—snow in
☾	23	42	42	30.20	30.10	32	SW.	do.		Clear day [the night.
	24	8	13	30.41	30.50	5	W. N.	do.		Clear day.
	25	19	30	30.33	30.10	26	E. N.	do.	.13	Cloudy day—snow in the
	26	31	35	30.00	30.00	30	N. W	do.		Cloudy—clear. [night.
	27	26	45	30.10	30.13	16	NW. SE.	do.	.20	Cloudy—rain—sleet.
	28	32	40	29.90	29.80	35	SE.	do.		Cloudy—rain.
	29	43	43	29.90	30.00	33	W.	do.	.30	Cloudy—rain.
										Rain—cloudy.
										Fog—clear
	Mean	30.86	36.65	30.01	30.03	28.62			4.19	

	Thermometer.	Barometer.
Maximum height during the month,	65. on 19th.	30.60 on 12th.
Minimum do. . .	8. on 24th.	29.30 on 5th and 6th.
Mean do. . .	33.75 . . .	30.02

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* The period will come when we shall be forced to look out for a substitute for coal. If when that time arrives, no new means of procuring heat economically shall be discovered, we may be able to draw from the great subterranean depository of caloric, and partly by means of the subterranean waters, heat for our various wants.

JOURNAL

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State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

APRIL, 1832.

An examination of Mr. Espy's remarks relative to the application of water upon the wheels at Fair Mount Water Works.

TO THE COMMITTEE OF PUBLICATION OF THE FRANKLIN INSTITUTE.

Gentlemen,—At page 73 of the current volume of the Journal of the Franklin Institute, I find Mr. J. P. Espy's remarks on an article which appeared in the fourth volume of the Franklin Journal, over the signature "L. M." I have only seen as much of the latter article as is quoted by Mr. Espy. Upon this he remarks, "Upon reading that part of the essay which relates to our works at Fair Mount, I was surprised to find a disparity between the power and the effect so great as three to one." And again he says, "the writer has also estimated too high the retarding influence of the inertia of the water put in motion by the buckets with a velocity equal to the difference of the velocity of the bucket, which is twelve feet, and the velocity of the water in the direction of the circumference of the wheel. This difference, on the supposition that the water comes on the wheel one foot from the surface, at an angle of forty-five degrees, is six and one-third feet."

The whole loss of power is estimated by "L. M." thus—"The velocity of the water in the required direction is that which is due to a fall of five and two-thirds inches.

"Immediately on striking the wheel it receives a velocity due to a fall of twenty-seven inches.

"The difference indicates the power expended by the wheel in giving it that velocity, - -	$21\frac{1}{3}$ inches
"The water comes on the wheel below the surface of the dam, - -	12 inches
"Total loss, - -	$33\frac{1}{3}$ "

Mr. Espy then says, "It appears to me that the following method of calculating is the true one—

"The velocity of the water in the required direction is five and a half feet; immediately on striking the wheel it receives an additional velocity of six and a half feet, due to a head of	8 inches
"The water comes on the wheel below the surface of the dam, - - -	12 inches
"Total loss, - -	20 inches."

From the foregoing statements, Mr. Espy arrives at (what I conceive to be) the erroneous conclusion, that water let on to a wheel, at a less velocity than that of the wheel itself, will give a maximum effect.

It appears to me that "L. M." has erred in supposing that water in motion at a velocity due to one foot head, viz. eight feet per second, at an angle of forty-five degrees, to the direction of the wheel, would oppose a resistance to the buckets, by the influence of its inertia, proportioned to the difference between the velocity of the wheel, and that of the water in the *direction of the wheel*, to wit, six and a half feet. This error is obvious from the fact, that the water strikes the soaling of the wheel at an angle of forty-five degrees, by which its motion, instead of being destroyed, is only changed to the direction of the wheel's motion; hence, all that can be lost by this change of direction is, what may be occasioned by the agitation of the water, and therefore it moves in the direction of the wheel at a velocity but little less than eight feet per second. If no part of the water should reach the soaling, and have its direction changed before the bucket had urged its velocity to twelve feet, "L. M.'s" statements would be correct.

Mr. Espy first sanctions "L. M.'s" error in relation to the action of the first motion of the water, by supposing it to receive from the bucket an additional motion of six and a half feet, when, in fact, it receives from that source but little more than four feet per second. Next he falls into the greater error, of *first principles*, to which, if he goes back, he will find that, when water is falling, or moving, at the rate of five and a half feet per second, a power equal to a head of eight inches will not increase its velocity six and a half feet, or raise it from five and a half to twelve feet per second, any more than the velocity of a heavy body could be increased from thirty-two to sixty-four feet by the same quantity of power that gave it the first motion of thirty-two feet.

By the recollection "that water produces a greater mechanical effect by gravity than by impulse, the paradox will" *not* "vanish;" for it follows as a corollary, that if water cannot communicate its whole power by impulse, it cannot receive the *whole* of any expended power by the same action.

I will here leave the subject for the present with the fullest confidence that Mr. Espy will at once see the error into which he has inadvertently fallen, and that he will as promptly correct it.

I feet confident also that he will perceive that no calculation, founded on sound principles, can lead to a conclusion that any velocity of the water, less than that of the wheel, can give a maximum effect.

As this subject has reference to our important works at Fair Mount, where the most economical use of water may *soon* be much more important than it is at present, any suggestions tending to improvement in this department of the works, may not be considered premature at this time. From the foregoing, it appears that in the present arrangement, twenty-seven inches, or more than twenty-eight per cent. of the head is lost by reason of the high velocity of twelve feet per second, at which this arrangement requires that the wheel should run: to which is added the loss sustained by the oblique direction of the water to a tangent to the wheel at the point of application, as noted above. To obviate most of the loss thus sustained, I will suggest a modification of the present arrangement, as follows: In place of the wheels now in use, the largest of which I believe is eighteen feet, I would apply three wheels of seven feet diameter each, for which I believe there is ample room. To these I would apply the water by what is termed the *pitchback overshot* principle, and drive them four and two-thirds feet per second, at which rate the same number of revolutions will be made as with the present wheels at twelve feet per second. The combined velocity of the three wheels will be fourteen feet, and will be competent to do more work than one wheel moving twelve feet in the proportion of fourteen to twelve, and will permit the stroke of the pump to be increased in the same ratio. With a velocity of four and two-thirds feet in the wheels, the effect of the water by *impulse* under a head of one foot, will be equal, nearly, to half the effect of the same quantity acting by gravity; hence, the whole loss of head will be but a fraction more than six inches, instead of more than twenty-seven inches, by the present arrangement. These wheels may be connected with each other by segments on their peripheries, or, by the simple and cheap application of two connecting rods. Each of these may connect the crank of an outside wheel to the common crank of the centre wheel, and this last may be connected with the pump on the present plan. These three wheels, with their connexions, will weigh, and cost, but little more than one wheel of eighteen feet diameter, and the frictions will be but little increased.

Very respectfully, yours,

C.

FRANKLIN INSTITUTE.

Reports of the Committee on Inventions.

The committee on inventions, appointed by the Franklin Institute, for the promotion of the mechanic arts, to whom was referred the consideration of the several subjects annexed, present the following reports, viz.—

On James Spicer's plan for Transporting the Mail, &c.

Mr. Spicer proposes to transport the mail, &c. between any two given points by the following arrangement. Tubes (of wood or metal) of uniform bore, are to be placed horizontally, and in a direct line between the two points; within these tubes the mail is to be moved. To effect this motion the mail is to be attached to an air-tight plug, moved by condensing the air upon one side of the plug, and rarifying it upon the opposite side. Mr. Spicer proposes to divide the distance between any two large towns, (as, for example, between Philadelphia and New York,) into sections of five miles each; an engine for condensing, (or exhausting,) being placed at one end of the section, while another for exhausting, (or condensing,) is placed at the opposite end. It is understood that it is proposed to use tubes ten inches in diameter.

To examine this device the first inquiry should be directed to ascertaining whether it is good or bad in theory, and if good in theory it would then remain to examine whether it is practically good, and finally, to estimate the cost of its application as compared with other modes of conveyance, as by rail-roads, &c.

The first question, in point of magnitude, in the theoretical examination of this machine is, do the known laws of the motion of elastic fluids, warrant us in concluding that air can be compressed and exhausted in the manner proposed? That air has inertia is proved by the familiar illustrations of its force when in motion, and its resistance, when at rest, to a body moving throught it. That air in passing through a tube would be retarded by friction is reasonable to suppose from the laws which apply to other fluids. To determine the amount of this resistance recourse must be had to experiment, from which alone, the data for correctly solving such problems can be obtained.

Many experiments have been made upon this subject, possessing various degrees of merit.* In an experiment made in England, by Wilkinson, the whole force of a large hydraulic wheel could not force air to the distance of 320 yards through a pipe one foot in diameter. Girard found that a pipe of .6 of an inch in diameter, and 364 feet long, diminished the discharge of air by .9. Other experimenters have made the expense due to resistance in passing through tubes, less; as those of Clement Desormes, in which a loss of thirty-five per cent. was produced in a pipe ten inches in diameter, and 1490 feet in length.

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* Annales des Mines, vol. ii. D'Aubuisson sur les Machines Soufflantes à Piston.

D'Aubuisson in an elaborate series of experiments,* made at the mines of Rancié, has investigated the amount of resistance experienced by air in passing through tubes of various lengths and diameters. The diameters experimented upon, were four inches, two inches, and one inch. The length from twenty yards up to 430 yards, (nearly one-fourth of a mile,) varying by lengths of twenty yards. The force of the air at the different points was measured by syphon gauges at opposite ends of any pipe; the difference in height of the two gauges measuring the force expended in overcoming the resistance of the air to motion through the pipe. From these experiments results a formula by which, having given the pressure of the air at one extremity of a tube, in inches of mercury, the diameters of the tube at the two extremities, the length of the tube, the height of the barometer which measures the pressure of the external air, and the temperature of the air, the pressure at the opposite end of the pipe may be found.

For the purposes of our examination, we may assume the air at 32° Fah. (0° of centigrade scale,) and neglect the effect of the increase of temperature by condensation, and its decrease by rarifaction. The diameter of the tube is also to be taken the same throughout, viz. ten inches. The height of the barometer is assumed at thirty inches. With these data the following table has been calculated from the formula, assuming that at one end of the tube there is placed a steam engine capable of effecting a condensation equal to eleven atmospheres. The first three columns give the lengths of the tube in different denominations, the fourth shows the effect at the end of this tube in terms of inches of mercury, as shown by a gauge at that point; the fifth the total elastic force of the air at the several distances, and the sixth the ratio of the compression at the two extremities, or the ratio of effect produced to force expended.

	Miles	Feet.	Inches.	Effect in inches of mercury.	Total pressure at the several distances.	Ratio of total pressure to force expended.
Condensation at the beginning of the tube 330 inches of mercury, or eleven atmospheres.	0			300.0	330.	1.
		20	240	287.2	317.2	.961
	$\frac{1}{8}$	660	7,920	118.1	148.1	.449
	$\frac{1}{2}$		31,680	58.6	88.6	.267
	1		63,360	37.7	67.7	.205
	2		126,720	23.4	53.4	.162
	2½		158,400	19.7	49.7	.150
	3		190,080	17.5	47.5	.144
	4		253,440	14.0	44.0	.133
	5		316,800	11.6	41.6	.126

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* D'Aubuisson, sur la Résistance de l'Air dans les tuyaux de Conduite. Annales des Mines, 2nd series, vol. iii. 1828.

We see by the table just given, that in a tube of only one-eighth of a mile in length, about five-tenths of the power applied is consumed in overcoming the resistance to the motion of air through the tube; that at a distance of half a mile seventy-three per cent. of the power applied is expended in the same way, and that at two and a half miles there remains as an effective propelling force, but fifteen per cent. of the whole power applied. Exhibiting a consumption of power which puts out of the question the adoption of such a plan. By similar means, the effect of exhaustion at the opposite end of the tube might be calculated, and since the same sources of resistance exist in this case as in the other, the conclusion can but be of a similar kind. The foregoing table shows that in a tube of twenty feet in length, the resistance would be altogether inconsiderable, and hence, in the model of Mr. Spicer, eighteen feet long, notwithstanding its small diameter, he was not enabled to detect any resistance which would have led to an abandonment of his plan. The committee can but regret that expenses should have been incurred by Mr. Spicer in bringing his invention before the public, which they understand he is ill able to afford.

The committee have hitherto considered this subject without reference to the question of its novelty, because they wished that the question of theory might be fairly met, and because they believe the idea to be original with Mr. Spicer, and therefore the credit of whatever ingenuity may be perceived in it, to be his due. In justice, however, to themselves and to the public, they must state that a patent was taken out in England in 1824, for a project in some sort similar to this. This patent which bears date February 19,1824, was granted to John Vallance, of Brighton, "for producing locomotion by stationary engines." The design of the patentee was as follows: an air tight tunnel, of about eleven feet in diameter was to be provided, within which, upon a rail-way, carrriages for the transportation of goods and passengers, were to move: these carriages were to be attached to a shield fitting air-tight within the tunnel, and motion to be communicated to the shield by exhausting the air in front of it by an engine stationed at the end of the tunnel towards which the shield was to be moved; the pressure of the atmosphere upon the opposite side of the shield would thus be the propelling force.

The plan of Mr. Spicer differs from this in being upon a much smaller scale, and for a more limited object, which is decidedly in its favour when compared with the other. A further difference is to be found in his use of the compression of air, as well as of its exhaustion.

On Franklin Peale's Moveable Diagrams for illustrating the construction of the Steam Engine.

The moveable diagrams submitted by Mr. Peale to the examination of the committee, are three in number, the first illustrative of the locomotive engine, the second of the ordinary low pressure engine, the third exhibiting the mode of operation of the trunk valve and of the forcing pump of the engine.

The first diagram is a longitudinal section and front view of the locomotive engine, exhibiting the structure of the boiler, its connexion with the cylinder, the transference of the motion of the piston rod to the wheels of the locomotive carriage, with the more important details belonging to the engine and carriage. The diagram is of pasteboard, neatly and perspicuously coloured. The parts to which motion is to be communicated, in the working of the engine, are formed of separate pieces of pasteboard, attached to each other by means which permit motion; each piece having the place which the part represented by it would occupy in a working engine: the assemblage thus composes an accurate representation of the machine, in which each part is free to take the motions which it really has in practice. Hence, while we are admitted to a full view of the interior of the machine, as by a faithful drawing, we see at the same time, and may study, the working of all the parts, as from a transparent model. In the diagram described, motion being communicated by the hand to one of the wheels of the carriage, the piston of the engine is seen to rise and fall; this motion seems to be transferred to the wheels, upon the axle of one of which an eccentric moves, giving play to the slide valve, thus seeming to continue motion to the piston by alternately admitting the steam from the boiler above and below the piston, and allowing its escape at corresponding periods from the opposite sides; the forcing pump by which the boiler is supplied with water, also is seen in action.

The second diagram is a highly finished representation of the low pressure engine, in which are clearly shown the communication of motion from the piston rod to the working beam, thence to the crank, the action of the fly wheel, of the eccentric in working the valves, of the cold and hot water pumps, and of the air pump; the engine may thus be studied in any of its working positions, and the relations of the parts in any one of these positions distinctly shown.

The third diagram is supplementary to the others, exhibiting in detail the working of the trunk valve, in its connexion with the cylinder, and with the positions of the piston, and also the working of the air pump; the valves of the pump are made to rise and fall alternately by a simple arrangement behind the diagram, and connected with the motion of the pump rod, so that the induction valve opens, as in practice, on the ascent of the piston, whilst the eduction valve closes, and vice versa, on the descent of the piston.

These moveable diagrams combine two qualities rarely united in the same apparatus. While they give a perfect representation of the machines to be illustrated, and therefore afford as elevated a means of demonstration as can be adopted, they furnish at the same time the most simple and pleasing method of exhibition; they are, in other words, equally valuable instruments for scientific or for popular illustration.

The committee give to this design their unqualified approbation.

On Charles Goodyear's Spring and Lever Fauset.

The committee are of opinion that Mr. Goodyear's spring and lever fauset is good in principle; the valve which closes the aperture being pressed down by means of a spiral spring, and in addition thereto, the pressure of the fluid contained in the vessel assists in making it tight; it is opened by means of a small lever, and in consequence of the valve not being subjected to friction, will not be liable to get out of repair. If properly made, the committee believe that these fausets will be superior to any other kind now in use.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN OCTOBER, 1831.

With Remarks and Exemplifications, by the Editor.

1. For *Beds with elastic steel springs of coiled wire;* Alonzo G. Hull, city of New York, October 1.

This bed is intended principally for the use of invalids, but it is said that it will be found very acceptable to others; the construction of the bed is very complex, as its whole surface is to be formed of separate cushions, which are cubes of three or four inches. Each of these cushions is to be sustained by a spiral spring, placed vertically, about an inch in diameter and six inches long. To connect the whole a sort of coat of mail is to be made of sheet iron, or other metal, by loosely uniting together quadrangular plates of three, or more, inches square; this may be effected by punching four holes in each plate, one on each side, at equal distances from its angles, and connecting together by rings a sufficient number of them to give the desired surface. One of the cubical cushions is to be fastened on each of these plates, and the springs are to bear against their under sides.

There is to be a floor, or platform of wood, in the usual place of the sacking bottom. This floor is to be in three parts, in order that the head portion of the bed may be raised, and the foot portion depressed, which is to be done by means of pulleys, in the manner of other invalid bedsteads. The lower ends of the springs are to be attached to the floor in a peculiar way, in order to allow of the raising of any particular part, or section, of the bed, according to the state and requirements of the patient. We shall not attempt to describe this contrivance, or several other auxiliary appendages. This method of raising any part of the bed is, however, a principal point in the claim of the patentee.

2. For a *Machine for planting Corn and other seeds;* Henry Todd, Pembroke, Merrimack county, New Hampshire, October 1.

In the planting machine here described, there is a round box to contain the seed, which box is fixed upon a suitable platform, and in this platform there is a hole to allow the seed to pass. Within the box, and resting on the platform, is a revolving bottom, which fills the whole diameter of the box; and in which there are two, three, or more holes, at regular distances, that coincide with those in the platform, so that the seeds may be dropped as they pass over it. A wheel pressing on the ground and having a bevil gear, gives motion to the revolving bottom. This apparatus, it is said, may be attached to a common plough, or, in preference, to one made for the purpose. The claim is to "the principle, application, and operation of said machine." There is nothing new in the *principle*, as it has been frequently used; and the patentee, therefore, could only be entitled to his own particular mode of applying it.

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3. For a *Cooking Stove;* Samuel Beals, Boston, Massachusetts, October 1.

The patentee observes, in the commencement of his specification, that he does not claim any thing new in the particular parts, but only in the general arrangement of his stove, which is intended for the burning of anthracite, or other fuel.

The body of the stove is, we suppose, to be made of cast iron; it has an open front, somewhat like that of an open, or Franklin, stove. There is a grate at bottom, but no bars in front, the furnace part being sunken, and lined all round with fire brick. There is, of course, an ash pit, to admit a draft of air under the coals. There are holes through the top for boilers; and a crane on which to hang a kettle is affixed to one side. The flue is at the back, and steam pipes from the kettles lead into this flue. An apparatus much like the common tin kitchen is used for baking, or roasting, and is so made as to fit into, and entirely to close, the open front. Doors open at the back of this apparatus, to admit of the necessary attentions of the cook.

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4. For a *Secret Bedstead for sofas and settees;* Williams Woolley, city of New York, October 3.

In the specification now before us, Mr. Woolley refers to a patent which he formerly obtained for bedsteads, observing that "the ground of the principle is the same" in the present instance. The bedstead, it is said, may be either extended from the front, or the back, or drawn out from the top of the sofa; the seat and cushion, in the latter case, forming a part of the bedstead.

Bedsteads constructed in the way proposed by the patentee, were common in former days, having been made to fold up into the appearance of common settees, sofas, bureaus, and other articles of furniture. The seat of a sofa, upon one of the plans proposed, is to rise upon hinges against the back; the bedstead, which is folded in joints beneath it, is to be drawn out, the sofa seat closed down, and the bedstead is thus made ready for use. What there is of a new principle in this contrivance, the patentee does not say, as his specification merely describes his modes of construction, without claiming any particular part.

The principal objection to bedsteads of this description is the difficulty of keeping them clean; there are in the different joints so many hiding places for vermin, as in this particular to set the utmost industry at defiance.

5. For a *Plough;* William Black, Anne Arundel county, Maryland, October 4.

The improvement claimed is the fixing a cutter, or coulter, upon the front edge of the mould board, by means of screws and bolts. The front, or cutting edge of this appendage is to be in the form of a segment of a circle, convex outwards.

6. For a *Machine for washing Gold out of sand and pounded ore;* Christopher Bechtler, Rutherford county, North Carolina, October 5. Issued under a special Act of Congress, the patentee being an alien.

An iron bowl is to receive the earth to be washed. This bowl is made with a flat bottom, and a vertical rim, presenting the form of a common seive. At one side of it there is a spout to allow water and sand to run off. The bowl is suspended from a piece of timber, like the dish of a pair of scales; the material to be washed is to be put into it, water also being allowed to run in to a proper height, the washing is to be effected by agitating the bowl in a particular way; the method of effecting this is the main point claimed, and is as follows:

Upon a flat table, or bench, there is to be fixed a band wheel, with a handle to turn it horizontally; the band from this wheel turns a small whirl just under the centre of the bowl, and a pin, placed a little out of the centre of the whirl projects up from it and passes into a hole under the centre of the basin; when turned, therefore, it keeps the bowl in agitation. Six bowls may be thus operated upon by one man, and the patentee says that one bowl will wash more than any other machine now in use, and that the most minute particles will be collected by it.

7. For a *Machine for washing Gold out of sand and gravel;* Christopher Bechtler, Rutherford county, North Carolina, October 5. Issued under a special Act of Congress, the patentee being an alien.

This machine has a hopper at top into which the earth is to be thrown by one hand, whilst another is employed in turning a crank to keep the moving parts of the machine in operation; these consist of a pump, a seive, and a rocking trough. The pump is to raise water enough to supply the hopper; from this the earth and water fall down upon a seive which is kept in agitation, and placed in a sloping position, which causes the larger stones to roll clear off, whilst the gold, &c. passes through the seive. From the seive it passes on to a concave rocker, standing a little inclined, and having a ledge in front to detain the heavier pieces of gold. The lighter particles flow with the water over the ledge, and fall upon a coarse cloth which is to collect them.

This machine, the patentee says, loses none of the metal, whilst all others lose from one-fourth to one-half.

8. For an improvement in the *Guitar;* E. N. Scherr, city of Philadelphia, October 6.

The patentee calls this instrument the 'Harp Guitar,' and claims nothing peculiar in its construction, other than giving to it greater length than usual, so that its end may rest upon the floor, instead of being held in the hands or on the lap, as is usually done. In other respects it may assume all the varied forms of the guitar; "the improvement is, that the harp guitar is played resting on the floor."

9. For a *Churn;* Amon Bailey, Poultney, Rutland county, Vermont, October 6.

A box is to be made in the form of the key stone of an arch, inverted. Through slots in the top of this pass the ends, or handles, of two vibrating dashers, which are to have slats upon their ends within the box; these slats are so arranged that they will pass each other. "The performer moves the handles of the dashers at the same time, in opposite directions, until the process is ended."

This improved churn will, we apprehend, exact a very awkward kind of action from the *performer.* There are many churns in which the cream is agitated much in the same way, but by more convenient appendages.

10. For a *Machine for cleaning Chimneys;* Thomas Hinkley, Hallowell, Kennebeck county, Maine, October 7.

In its general construction this machine resembles many others which have been contrived for the same purpose, and some of which have answered very well in certain chimneys, although no one has yet been invented which can be used generally; nor, in the present state of affairs, is this to be anticipated. Chimneys are built according to the suggestions of the ignorance, intelligence, fancy, or caprice, of the bricklayer, without rule or plan; in the same flue they vary greatly in size, and are sometimes as tortuous as whim, accident, or genius could make them; and although fire or a climbing boy may be able to find their way along them, and operate upon all their sides and angles, it will require some universal genius to contrive a machine which shall be able so to do.

In the present machine there are four elastic arms, made of iron or steel, with brushes, or scrapers, as the case may be, attached to their ends, the arms being adjustable by means of segments of circles and thumb screws, placed near their junction at the lower part of the machine. When used a weight may be hooked on to the bottom, and a rope attached to the top of the machine.

The points claimed are "the adjusting arcs, with screws to regulate and fix the arms for the brushes and scrapers; the action of the screws by which they press constantly against the side of the chimney; and the mode of adjusting the scrapers and brushes upon the arms, according to the dimensions of the chimney."

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11. For a mode of *Applying High Steam, and Hydrogen Gas, to aid in producing Combustion in the use of Anthracite Coal;* Paul Chase, city of New York, October 7.

The principal object aimed at by the patentee, is to supply a portion of hydrogen gas, obtained by the decomposition of water, to aid the combustion of anthracite in the furnaces of steam engines. In the arrangement described and figured, there are circular bellows, worked by a rod from the lever beam, to assist in supplying atmospheric air; this air is conducted by a pipe into a tube, or retort, of iron, which is placed across the fire place immediately under the bars of the grate. This tube, or retort, has holes in its upper side, to allow air and steam to escape into the furnace, between each of the grate bars. The steam which is to accompany the air is to be generated from water furnished through another tube connected with a reservoir of that fluid, the supply being kept up by a force pump. The proportion of water to that of air is to be as twenty to eighty.

When the air and water escape into the furnace, they do so, according to the statement of the patentee, in the form of "hydrogen gas, or high steam," which gas, or high steam, is to be taken up by the draft into the body of ignited coal, and cause a flame to extend throughout the fire-place and flues.

The patentee, it appears, filed a description of his invention in the patent office in March, 1828; the proposition to aid the combustion of anthracite by means of steam, is, however, of older date than this; yet we infer that this is the only thing intended to be patented. We say infer, because we are not clearly informed in any part of the specification, what is meant to be claimed as new. The drawing referred to in the description is very well executed, and the instrument has been carefully written, still it gives no instruction respecting several important points, and more particularly that of the claim.

There is mention made of water pans, which have rods of iron in them, to operate by the motion of a boat, and agitate the water in aid of the action of the above described tubes; this is all we hear respecting them.

As regards the theory, the truth of which is so generally taken for granted, that because the flame from burning fuel is expanded, or rendered diffusive by the action of steam, the water must be decomposed into its elements, oxygen and hydrogen, we have never admitted it as true. This is not the place to discuss such a subject, but it will be at once apparent to every one acquainted with chemistry, that such a decomposition of water must be simultaneously, or instantaneously, accompanied by its recomposition, and so far as the generation and extinction of heat are concerned, it would appear that one of these processes must exactly balance the other.

Water, when decomposed by passing over ignited charcoal, is converted into carbonic acid and hydrogen; if oxygen be supplied in sufficient quantities by the admission of atmospheric air, this hydrogen will burn with flame, otherwise it will pass off with the products of combustion, without contributing in any degree to its intensity.

In the year 1818, Mr. Morey and Mr. John L. Sullivan each obtained patents for what they called "water burners;" we have not those patents now before us, but we recollect that water, or steam, was admitted among the flaming bituminous fuel, and that its effect was greatly to increase the volume of the flame; we then thought it did this by its expansive force only, and not by any actual increase of the quantity of flame. The method was not found to be productive of the anticipated economy, and the plan was consequently abandoned.

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12. For a *Machine for cutting and chiseling Stone;* Larman Z. Parke and Iram Brewster, the former of Delaware county, the latter of Schoharie county, New York, October 10.

In this machine rows of chisels are to act simultaneously upon a block of stone; an upright frame being made to sustain the apparatus. The block of stone to be cut is placed upon a carriage, or platform, which rests upon rollers, and which can be raised and lowered by screws, or other means. The chisels are retained in their proper positions by moveable racks, or rests, and each of them is raised from the stone by means of a spring acting in a notch at its upper end. Hammers, which strike upon the chisels, are to be lifted by cams placed upon a revolving shaft. The arrangement of the parts, and the modes of adjusting them, appear to be well imagined, and likely to answer the purpose intended.

The only claim made is to the privilege of varying the mode of construction and action, in certain particulars, from that designated in the description.

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13. For a *Machine for shaving the Hair from Deer Skins;* Rodolph Groning, city of New Orleans; an alien who has resided for two years in the United States, October 10.

Three rollers, each about three feet ten inches long, and three inches in diameter, are to be placed parallel to, and at a small distance from, each other in a suitable frame. The skins are to be passed up from below, between two of the rollers, and brought forward under a stationary knife of the length of the roller; a vibrating knife is at the same time made to operate, and by the action of the two, the hair is to be cut off. The claim is to the before described machine. The description, however, is not such as will enable a workman to construct it; the manner of fixing, and the action of the knives, not being made any more clear than they are in the above notice of them.

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14. For a *Machine for Spinning Hemp and Flax,* and other fibrous substances; Daniel Treadwell, Boston, Massachusetts, October 11.

The description of this machine extends to upwards of forty pages, and refers to sixteen figures, in which its respective parts are represented by drawings. From the nature of the case, it is not possible to present a good idea of the instrument without giving the whole of these. The subjoined extracts, however, are all that we can at present offer. The patentee observes, that "Before proceeding to the description, it will be useful to state, that spinning may be considered as consisting of two operations, first the drawing out of the filament to the required fineness, from a mass of the fibrous material, commonly in the state of roveing, or rolls; and second, the twisting of the filament so drawn, which completes the formation of the thread, or yarn. In some modes of spinning both of these operations are carried on at the same time in the same portion of the material; that is, the filament is elongated during the operation of twisting. In the invention herein described, the filament is drawn to the proper size before twisting it in any degree."

The patentee in his summary at the end of his specification, observes, that it has been necessary for him to describe a great many well known mechanical instruments, in order to show their application in this machine, without intending to advance any claim to the invention of them; and then proceeds to state, under four distinct heads, what he considers as original.

First. The combination of plates, points, pins, clearers, straps, &c. as described, which forms what is called the hatchel belt, and which, with its appendages, serves to draw out the material to be spun.

Second. A combination of instruments which constitute what is called the regulator, with the manner in which it is connected to, and operates with, the other parts.

Third. The combination of the comb, and apparatus by which it is operated upon, for the purposes described.

Fourth. A stopping guide and weight, by which the machine is brought to rest, wherever the unity of the yarn is destroyed.

These claims are guarded by stating that it is not intended to limit them to the precise forms represented, as these may, in every case, be varied, but to embrace that principle, or mode of operation, the character of which is pointed out in the particular description given.

From a very careful examination of the whole subject, as well as from direct information, and from confidence in the solid talents of the patentee, we are of opinion that this machine will prove to be one of great value.

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15. For an improvement in the *Manufacturing water proof Wool and Fur Caps;* Laban L. Macombier, Gardiner, Maine. First issued January 19th, 1831; surrendered and reissued October 11.

In the first patent it was stated that the improvement was for a "composition of matter used in stiffening fur hats and caps, by the use of Indian rubber, (elastic gum,) either in combination with gum shellac or alone." In the present it is said to be for a "mode of manufacturing caps of fur or wool, whereby they are rendered water proof, and so elastic and pliable as to be folded in a small compass, and packed with clothes in a trunk, or elsewhere, after which they can be made to resume and keep their original shape, by using elastic gum, either alone, or in combination with gum shellac, and other resins."

The elastic gum is to be dissolved in turpentine, petrolium, or any suitable solvent. If shellac is used with it, this is to be dissolved in alcohol, and the two solutions mixed together, in the proportion of one part of the latter to about seven of the former. The solution is applied to the cap, which is then to be steamed until the solution is dry. The bodies of fur caps are then napped in the usual manner, coloured, and ironed. Those of felt are treated in the same way, with the exception of the nap.

The claim is to the application of elastic gum alone, or in combination, as above stated.

We have not seen the hats or caps as finished by Mr. Macombier, but learn that they fully justify the assertion of the patentee, that they bear folding up, and packing away, without injury; we should apprehend, however, that this character must more fully appertain to the cap, than to the hat.

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16. For a *New Portable Oven for Roasting and Baking;* William Goddard, Portsmouth, Rockingham county, New Hampshire, October 12.

This oven is formed of three separate sheets of iron or tin, and is in the form of a segment of a cylinder: in making it, sheet metal of suitable dimensions is bent round so as to form about three-fourths of a circle, the edges are then joined by a flat piece, which forms the bottom of the outer case. A second piece of sheet metal is then bent into the same form, but is to be the segment of a smaller circle than the first, so that when slipped into it, there will be the space of an inch between them; this when in its place, is to be rivetted to the bottom of the outer case. A plate is to be put on at the back end, and a rim fixed, enclosing the space between the two at the front. The space may be filled with charcoal, or other bad conductor, or may be occupied by air only. Through both these vessels two holes for flues are to be made at the top, one near to each end, and these are to lead to one common pipe, furnished with a damper; another hole is to be made for the escape of steam. Heat is to be applied by a round stove, or furnace, under the middle of the oven, a hole being perforated through the bottom sufficiently large in diameter to receive it; and a ring of cast, or of wrought, iron is rivetted to the bottom, in order to give the requisite strength to this opening.

A third box, made in the form of the other two, constitutes the oven proper. This is made exactly in the form of those already described, and is to be slipped into its place within them, leaving a space between it and the second box, and also between its back end and the first, which space is for the passage of smoke and heated air from the fire, around the oven, to the flues. The bottom of this is exposed to the action of the fire in consequence of the perforation made through the outer box. When this last is secured in its place a door is to be fitted to it in the usual way.

There is no claim made to any part of this apparatus; the security of the patent, therefore, must depend upon the general novelty of its construction.

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17. For an improvement in the construction of *Steam Boilers;* Peter Cooper, city of New York, October 13.

This boiler is one of those which is so constructed as to expose a large surface to the action of heated air from the furnace, by dividing the inside into separate chambers, and by using tubes which communicate from one to the other. Its exterior form is that of a vertical cylinder, the outer case forming a jacket between which and the respective chambers, a portion of the draft may pass.

The furnace is a hollow drum, upon the flat bottom plate of which the fuel is placed; water is contained below, above, and around it. Air is supplied from the ash pit through numerous tubes secured at one end to the bottom of the cylindrical jacket, and at the other to the bottom of the furnace. From the top of the furnace pass up tubes, surrounded by water, and which open into a space under an upper drum, or chamber, containing water. Iron bolts pass from the bottom to the top of this upper chamber, to sustain the heads against the pressure of the steam; and there are similar bolts wherever else they may be thought necessary.

There are several particulars in the construction of this boiler which are claimed, the principal of which are the following:

The mode of constructing the bottom of the furnace of parallel plates, between which water is contained, and through which tubes pass to supply air to the fire; thus obviating the objection to the hollow bars, filled with water, which have been repeatedly tried, without success, as they are apt to burn off in consequence of the water being converted into vapour, an accident which the volume of water and the particular construction of this furnace will prevent.

The separating of the boiler into two parts, and the tubes in the lower one, are also claimed; likewise the outer covering, or jacket, so constructed that the smoke and dust are forced out in a downward direction under the bottom of the boiler; and finally "the combination and form here described, in principle, as well as in detail."

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18. For an improvement in the *Machine for Weighing Wagons, Carriages, Boats, and other bulky substances;* James Coulter, city of Philadelphia, October 14.

This machinery is certainly an improvement upon the kind *first* employed for the same purpose, but not upon several others of more modern invention, and in extensive use.

A platform is to be made of sufficient size to receive the load; which platform is to be suspended, like an ordinary scale, by rods rising from its four corners, and united at the top to a piece of strong timber pendant from the short arm of steelyards. From the long arm of these steelyards a rod descends to other steelyards placed at a convenient height above the platform and furnished with its moveable weight in the ordinary way.

These are all the essential parts of the instrument, the novelty of which has eluded our view. The claim is simply "to the before described machine."

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19. For a *Rail-road Car, running on a single rail;* Charles F. Zimpel, city of New Orleans, Civil Engineer, late of the Prussian army, but for two years past a resident of the United States, October 15.

The single rail here proposed differs essentially from that patented by Palmer in England, upon which the car was to be suspended. The rail in the present instance is to rest upon the ground in the ordinary way. It does not appear to be the intention of the patentee to propose the employment of his single rail as a substitute for railroads for general traffic, but principally to be used on plantations, such as the sugar plantations of Louisiana, for carrying the cane to the sugar house, or the transportation of other articles to be conveyed a short distance only. The rail is to be entirely of timber, the whole width of which will be somewhat upwards of two feet.

There are to be two main wheels, one at each end of the car, which are to be about two feet in diameter, and one foot thick; it is proposed to make the face of each wheel concave for about six inches, leaving a tread of three inches at each edge. These wheels are to run in forks formed at the ends of the piece of timber which constitutes the perch, or beam, of the carriage. The body of the car is to hang on pivots at its upper edge, allowing it to vibrate laterally. For this purpose, posts rise vertically from each end of the perch, and receive the pivots by which the body is suspended.

The main part, or centre, of the rail, upon which the wheels run, must be somewhat more than a foot broad, and to each side of this main piece other rails are to be fastened, each six inches broad, and rising four inches above the main rail. The wheels therefore run in a trough four inches in depth. Upon the axles of the wheels, which are extended out at each side of them, there are safety wheels, of such diameter as not to touch the additional rails when the car is vertical, but to come into contact with them should it tilt on one side.

It is stated that the object of hanging the car upon pivots is to preserve the centre of gravity; but it is evident that if it swings either way it must carry the centre of gravity outwards, and tend the more to upset. There is no provision made for turning on a curve, and it would seem, therefore, that the road must, in all cases, be absolutely straight.

Although no claim is made, the novelty of the general arrangement appears to be sufficiently obvious.

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20. For an *Instrument for scraping Broom Corn;* Billy J. Billings, and John S. Billings, Gorham, Ontario county, New York, October 15.

An instrument much in the form of the common vertical reel, is made to revolve, carrying scrapers, or knives, at the ends of its arms, which scrapers, or knives, are to clear the broom corn from seed and dust. The corn is held in the hand, and laid upon the curved bed over which the scrapers revolve. The patentees state that by this machine they are enabled to do much more work than formerly, and that by its operation the seeds and dust are driven away from the workman.

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21. For *Tubular Essence Phials;* John Staniford, city of Boston, October 17.

Essence bottles, instead of being blown in the ordinary way, are to be made out of glass tubes; they will, consequently, be much more regular, neat and beautiful than usual. In this mode of making them the roughness upon the bottom is avoided, no punty being used in forming them; and the patentee states that they can be afforded at the same price which is paid for the inferior article.

Tubes of the proper size are to be divided into lengths sufficient to form two phials; each end is to be successively heated by a glass-blower's lamp, and the brim and neck shaped by pincers made for the purpose; the tube is then to be heated in the middle, separated, and the bottoms rendered perfectly flat and smooth by pressure against a piece of iron. In shaping the phial, an inclined plane is placed beside the lamp, upon which the tube is rolled.

There is no direct claim made, but the novelty, according to the statement of the patentee, appears to consist in the use of this inclined plane, and in the particular form given to the pincers to adapt them to the intended purpose.

The making of phials from glass tubes is not new; we have occasionally seen in use such as have been so made, and there is, probably, no one in the habit of blowing glass by means of the lamp, who has not made them for his own amusement, although they may not have been manufactured for the purpose of giving a general supply. The patentee might fairly claim whatever there is of novelty in his mode of procedure, but not the mere making of phials from tubes.

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22. For an improvement in the *Book Binder's Cutting Press;* Charles Stimpson, city of Boston, Massachusetts, October 17.

The improvements here claimed are two; first, the suspending of a board under the press, which shall serve as a gauge upon which the book to be cut may rest, instead of adjusting it as heretofore, by the aid of a mark made on the edges of the paper; there are to be three screws with nuts on them to support and adjust this board, or gauge; two of them descend from the right hand cheek, and one from the middle of the left, each of them passing through the board, and having nuts underneath it. The second improvement is the fixing of the two strips of wood, called the square, and cutting board, to the cheeks of the press, by means of screws, so formed that they can be readily adapted to other squares and cutting boards, instead of replacing them every time a book is put into the press.

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23. For an improvement in the *Steam Engine;* Ithiel S. Richardson, Newmarket, Rockingham county, New Hampshire, October 17.

The improvement here proposed is as new as a great many others for which patents are taken; therefore, if not quite novel, it has fellows to keep it in countenance.

The proposition is to employ two or three cylinders with rods from their pistons operating upon the same shaft; the cranks making such angles with each other as shall correspond with their number, so that one or more may always be in action, and thus the necessity for a fly wheel be obviated.

If the plan itself is not new, at least some of the advantages which, according to the patentee, it is to produce, are truly so. One of these is that the steam will be constantly flowing into one or other of the cylinders, and thus all danger of explosion be avoided; another is the getting the same power with a diminished portion of fuel; the how or the why *we are not* told.

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24. For *Making Sleys and Reeds for Weaving;* Horace Holt, Rutland, Meigs county, Ohio, October 17.

The general construction of this engine, is that called the vibrating reed engine, but the feeding, instead of being regulated in the ordinary way by a spring, is effected by means of a screw having a cog wheel on its end, mashing into another cog wheel operating on the flyers. When the machine is to be drawn back, a spring box, forming the nut of the screw, is withdrawn, and the desired motion effected.

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25. For an improvement in *Pumps;* Noble Phelps, Turin, Lewis county, New York, October 20.

The improvement claimed, is in the piston, or bucket, and in the manner of placing the valves; the other parts, we are told, are to be made as usual. The piston is to be a leather bucket in the form of the letter V, into which the lower end of the piston rod is to pass, and to be securely nailed there. Two straps of leather nailed to the piston rod above the bucket, descend, and are attached to the latter, supporting it like a bail. There are, it seems, to be two valves below the bucket; one at the bottom of the chamber, and the other in its usual place. The use of these we know not, as the bucket, if it operate at all, must act as a valve, collapsing as it descends, and expanding in its ascent. The use of three valves in a common pump we are yet to learn, its disadvantages are easily shown. We are informed that in consequence of the use of this conical bucket "the working chamber may be enlarged to any convenient size, so as to convey a large quantity of water to the spout." We presume, however, that in this, as well as in other pumps, the power must be increased with the increase of size in the chamber; if this be not the case we are ready to concede to the magnitude of the said improvement.

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26. For a *Parturient and Invalid Bedstead;* Joshua N. Robbins, Troy, Rensellaer county, New York, October 20.

This bedstead, "not known or used before" very much resembles several other invalid or hospital bedsteads, parts of it being made to raise by means of racks and pinions; and other contrivances being appended for the relief of those who require them. The patentee describes the whole without claiming any part, and although we might point out such minor differences between this and others as will be made by different workmen in structures which are essentially the same in principle, we should be unable to do more than this, and could not, therefore, supply the deficiency in the specification.

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27. For an improvement in *Paving Streets;* John L. Sullivan, city of New York, October 20.

The common effect of moisture, and more especially of frost, in loosening the earth under pavements made in the ordinary mode, are enumerated by the patentee, and the object which he proposes to accomplish, is to guard against these injurious effects, by laying the pavement in a cement which shall prevent water from insinuating itself between, and passing under the bricks or stones employed, and as the earth will thus be kept in a uniform state of dryness, that expansion which always accompanies freezing will be prevented, and the pavement remain permanent.

The ground is to be prepared by giving to its surface the proper form, and by consolidating it by means of rollers or rammers. Water, lime, or other impervious cement is then to be spread over the ground in a semi-fluid state; upon this the paving stones are to be laid as close to each other as possible; the interstices between them are then to be filled up by pouring upon them the same fluid cement, after which pulverized stones are to be strewed over and rolled down, the superfluous portion being scraped off as the work proceeds.

The principle, or mode of procedure, claimed, is the paving with common paving stones, or fragments of quarries, and setting them in with impervious cement. In the March number of this Journal for the year 1828, p. 179, there is a specification of an improved method of paving, for which a patent was granted in England, and which method is nearly identical with the preceding. The laying of stones in impervious cement, was practised by the ancients; the Roman ways may serve as examples; the practice has been followed in many parts of Italy, and in other countries, to the present day; a patent taken for doing so, must, therefore, be restricted in its object to the precise mode described by the patentee.

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28. For *Measuring for and Cutting Garments;* James Henderson and Cooper K. Watson, Zanesville, Muskingum county, Ohio, October 12.

If a judgment may be formed of the progress of any art by the *improvements* in it which are registered in the patent office, that of the tailor has not lagged behind in the grand race. It is not to the patent office alone, however, that we are indebted for a proof of this fact; no mean portion of the literature of the day has been devoted to the same subject, and we meet, almost everywhere, with pictorial illustrations of the variety of modes in which "nature's noblest work" may be embellished, or distorted, by the directors general of the fashionable world.

We have neither the theoretical nor the practical knowledge necessary to perceive the nice shades of difference in the various instruments contrived to assist the professional artist, and from fear of displaying our ignorance, as we have not had room for the whole, we have hitherto given but a brief and general view of them, a practice from which we shall not venture to depart on the present occasion.

The principal instrument now before us consists of a vertical measuring rod, sufficiently long to take the altitude of the tallest man. Upon this standard there are three sliding pieces with projecting arms, which are to be adjusted so as to mark the three cardinal points in the longitudinal admeasurement. To the uppermost of these slides, a scale of about three feet in length is attached; this scale slides in a groove in the standard, and is provided with graduated divisions, the correspondence of which with, or relationship to, other divisions upon the standard, indicate the manner in which the garment must be marked, before the shears are employed. These indications are properly explained in the specification, to which those interested are referred.

For the rotular and diagonal admeasurements, leather straps are employed, which are to be properly graduated. In the art of drafting the garment, a square is to be used, which square has graduations upon it corresponding with those of the general system, and adapting it to individuals in all their varying proportions.

The claims are to "the groove in the standard by which the length of the body, and a certain permanent point for the waist are ascertained; and to the straps by which the various curves and irregularities on the surface of the body are measured, and also the square described, and the manner of ascertaining the curve of the waist and spring of the skirt."

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29. For an improvement in the *Machine for breaking, dressing and cleaning of Hemp and Flax;* and softening and freeing the filaments entirely of shivers; La Fayette Tibbots, New Glasgow, Amherst county, Virginia, October 22.

Mr. Tibbetts refers to a machine for the same purpose, patented by him on the first of August, 1829, as the foundation upon which rest the improvements now proposed; that is, upon what he calls the "arch principle." His improvement consists, he tells us, in re-acting powers, which drive the gearing of his rollers thirteen feet, more or less, forward; which power returns back again to the point whence it started, like the vibration of a pendulum. This gearing is so constructed, however, as to cause the action of the breaking rollers to be greater in the forward, than in the backward direction; and the claims made are to "the principle of the vibrating or re-acting powers, which revolves the fluted rollers as far forward as back; together with the construction of the power gearing, the position of the parts, and the manner of operation of the instruments generally; also, the re-action or vibration of said rollers in their revolutions to operate further forwards than backwards, in order to gain from three to twelve inches in each vibration." The principle of vibration is also claimed, without restriction to any particular form of gearing, or instruments for effecting it.

Many patents have been taken for machines for breaking hemp and flax, and much money has been unfortunately spent in their erection, whilst but few, if any, of them have continued in use sufficiently long to test their adaptation to the purposes intended, and to correct those imperfections incident to a new machine. For the cause of this we must inquire further than into the mere construction of the machines themselves. The culture of the raw material, with us, may be said to have hitherto been a failure; either from soil, climate, or inexperience in management, our hemp is inferior to that imported from Russia, and whilst this is the case, neither our national or mercantile marine will be trusted to cables, hawsers, or sails, manufactured from it. For ourselves, we are equally unwilling and unable to believe, that in our widely extended country, a country affording almost every kind of soil, and variety of climate, a plant which grows so luxuriantly in many situations, must necessarily be inferior in those properties which give to it its greatest value; we will, therefore, still indulge the hope, that perseverance, and consequent experience, will yet suffice to establish an article so necessary both in the arts of peace and war, as one of our staples.

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30. For an improvement in the mode of *Thrashing, cleaning, and grinding of Wheat* and other grain; La Fayette Tibbotts, New Glasgow, Amherst county, Virginia, October 22.

The description in both this and the preceding patent, is, to us, very defective in point of clearness. We shall not, therefore, attempt to designate the particular improvements made. In the present machinery there are several things claimed, but in that broad way which does not very clearly distinguish the same from all other similar things before known or used. This the patentee calls a portable or local mill, and of it he claims *the principle.* "Also the principle of the bridge tree and rattle staff springs, and the bridge tree rod and rattle staff hollow screw for regulating the mill, together with the application of the bolt to receive the meal from the mouth of the spout," &c.

When Oliver Evans introduced his improvements in mills, such as the elevators, hopper-boy, &c., their nature and use were of easy designation; we saw clearly in what they consisted, and could easily answer the questions, what are they? and what are they for? the present, however, are more recondite, and we must refer inquirers to the inventor.

The thrashing machine, included in this patent, may be driven by the same power as that which drives the mill; the latter being "local," (*locomotive*, we suppose,) may be removed, and the former applied. The claim in the thrashing part is to "the principle of double action in thrashing wheat and other grain by beaters, rollers, &c. &c.; or by any two or more revolving motions, one above the other, so as to let the straw containing the grain pass between said motions of beaters, &c. The said principle of revolving beaters, *above* as well as *below*, all turning inward, and drawing the grain in the straw through between them, as fast as the feeding rollers deliver the same, is what I claim under the principle of double action, by pairs of beaters or otherwise."

The *principle* spoken of as applied to the thrashing machine, is the placing around a large cylinder, three or more smaller ones, in the manner of the small carding rollers in a carding machine.

Without attempting to touch the question of novelty; there appears to us to be two objections against the specification of this patent, *first*, the things claimed are not presented with sufficient distinctness; and *secondly*, it is not a patent for *a machine*, but for two separate machines. There is no more necessary connexion between the thrashing machine and the mill, than there is between the mill and a baker's oven, yet it would appear rather strange to take out *one* patent "for a mill for grinding meal, and an oven in which the same may be baked into bread."

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31. For an improvement in the *Construction of Chimneys*; Henry Antes, Harrisburgh, Dauphin county, Pennsylvania, October 24.

A single flue is to be carried up from the cellar to the top of the chimney, and into this flue a throat passes from every fire place. These fire places may stand back to back, so that six fire places, on three floors, may open into the same flue, which, in this case, we are told, may be three feet wide, by one foot two inches in the clear. Air flues, to supply a draught from without the room, are to pass down the jambs, and open into the fire places. The ashes are to be conducted into the main flue, through openings made for that purpose, and are to fall into an ash pit in the cellar, where there is a man-hole, closed by a door. Shutters, or registers, are to be applied to each of the throats of the fire places.

The claim "is the improvement before described; particularly in proportioning the inlets to the capacity or area of the flue of the chimney, and in requiring only one flue for any number of fire places in the same stack."

We apprehend that separate flues to each fire place, would be an *improvement* upon this plan, although, in certain cases, we have known one common flue to answer well for six furnaces. We know of a chimney, built nearly forty years since, for a casting shop for a brass founder, which consisted of one wide flue in the wall, into which six furnaces opened, and we also know that the draught was perfectly good, better, in fact, than in ordinary furnaces, whenever all the furnaces were in blast; but when the number was diminished, the air in the large flue was not sufficiently rarified, and the draft was proportionally decreased. Such will be the case with the chimnies in question; if fires are lighted in every fire place, it may do well enough; but, if otherwise, one of "the miseries of human life," a smoky chimney, will have to be encountered. The throats of two fire places opening against each other, as shown in the drawing, is a part of the plan which will be found not to answer in practice.

32. For a *Thrashing Machine;* William Prescott, Pottsville, Schuylkill county, Pennsylvania, October 25.

We have here a thrashing machine which affords us some relief from that eternal round to which the whirling cylinders of most others are to be subjected. We in this case return, it is true, to something like the older thrashing machines, those which existed before the first Scotch cylinder machine was made.

By the present machine the thrashing is to be performed on the barn floor, by rows of flails, or beaters, acting like those for batting wool and cotton. The four legs of the frame have grooved rollers on them, which run upon parallel bars, forming a rail-way along which the machine may be shifted, to prevent the continuance of the blows on the same spot. A shaft carrying a fly wheel, is to be turned by a crank; this, by means of two other cranks and pitmen, gives a partial rotary motion to rollers working on gudgeons in the frame, on either side of the machine. These rollers sustain rows of flails or beaters of wood, which are connected to them by elastic bars, serving as springs.

When horse, or other sufficient power is used, the number of flails, rollers and cranks may be increased.

The claim is to "the before described machine, for thrashing grain by means of vibrating flails."

The "before described machine," although differing something in arrangement from others acting upon the same principle, is so similar to them, that we think it should have been said in what part the improvement resided, we also think that this might have been done.

33. For a *Machine for Hulling Clover;* Pearson Reading, Trenton, New Jersey, October 25.

There is to be a revolving cylinder set with iron teeth, and rows of iron plates; the cylinder may be about three feet long; this is to revolve within a barrel, or casing, made of staves and set with iron teeth. The casing is to be a little conical, allowing more space at the feeding than at the delivering end. The seed is to be put into a hopper, and forced down on to the cleaning roller by a follower. We are told, that by removing the casing, and supplying a hollow segment, set with teeth, it may be converted into a thrashing machine.

Whether this is intended to make a part of the patent, or in what the peculiar merits of the machine consist, we are not informed, as there is no claim made.

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34. For a *Machine for Planing Plank and Boards;* Ebenezer Lane, Cincinnati, Hamilton county, Ohio, October 26.

Plane irons, of the ordinary kind, are to be placed in a row, about two inches apart, when the irons are two and a half inches wide. The stock in which they are fixed is to be of cast iron, and the irons must stand the reverse way from what they do in a common plane, their cutting edges being towards one side of the stock, all the irons in it lying in the same plane. Another stock is to be prepared to stand behind the former, with the irons placed between the spaces of the first, and in this way several stocks may be arranged. These are then to be fixed in a strong wooden or iron frame, one behind the other. This frame may be stationary, and a carriage, or bench, running upon wheels, and bearing the stuff to be planed, may then be forced under it by any adequate power; or the plank may be stationary, and the frame, with the cutting irons, carried over it.

The claim is to the frame containing the plane irons, and to their arrangement.

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35. For a *Thrashing Machine;* Ebenezer Gordon, and David T. Gordon, Oswego county, New York, October 27.

We have nothing very particular to say respecting this machine, as its history has already been given in the detailed accounts of some of its predecessors. It consists of the ordinary cylinder and concave set with teeth. The specification enters into a very minute description of its respective parts, and contains every thing relating to it with the exception of that which is of some importance, to the patentee at least, namely, the designation of those parts which are new, and upon which the claim to a patent depends; to have pointed out these, however, might possibly have "puzzled a Philadelphia lawyer."

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36. For a *Chimney Valve;* John Baker, Lancaster, Lancaster county, Pennsylvania, October 28.

We may next look to see a patent taken for handkerchiefs to be worn in the pocket; for although they are somewhat more common than valves in chimneys, their claim to novelty is about equal.

The valve proposed, is a shutter of cast or wrought iron, fitting in, and hinged to a frame in the chimney, with a segment rack to support it at any desired height. Having a wife and children, and gray hairs which tell of olden time, we have nothing to fear from the averment, that when we first saw such valves in chimneys, nearly half a century ago, they were no novelties.

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37. For additions and improvements in a machine patented on the 4th of November, 1830, called a *Machine for Scraping the Flesh and Hair from Hides and Skins*, and for all other scrap-

ing necessary in tanning and currying leather; Thomas Williams, Rochester, Monroe county, New York, October 31.

For the general construction and use of this machine, we must refer to the specification, p. 173, vol. VII. The improvement now claimed is the application of a cylinder with knives, placed either straight along it, or obliquely; (the oblique position favouring the spreading of the skins,) with a concave against which the roller acts, and which is borne up against it by means of spiral springs. The various parts for giving motion to the machinery are also claimed, as "the application of the carriage and its appendages, and of the crank, levers, cog wheel and pulleys, pinion, and cylinders, to the purposes for which they are to be used in the said machine."

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38. For an improvement in the *Construction of Steam Boilers, to regulate the height of Water within them;* Dummer M. Hooper, New Albany, Floyd county, Indiana, October 31.

A float, made of any suitable materials, such as wood, cork, or metal, is placed within the boiler, and is to rise and fall with the water in it. A vertical rod attached to the float, slides through guide pieces, which retain it in its proper position. The upper end of the rod is made conical, that it may operate as a valve, the seat of which is the open end of a steam tube, which passes through the top of the boiler; when the float is borne up by the water, the valve comes in contact with the lower end of this pipe, and closes it; when the float descends, by the diminution of the water, the valve is to open, and allow steam to escape through the aforesaid tube. This tube does not lead to the cylinder of the main engine, but is intended to set a separate small engine at work, made expressly for the purpose of operating upon supply pumps to fill the boiler.

The inventor says that "this mode of supplying boilers with water by an engine expressly for the purpose, which is put in motion or stopped by means of a float within the boiler, which I call an 'improved self-regulator,' is what I claim as my invention."

The necessity of employing two engines in the place of one, would, alone, present a formidable difficulty in the way of introducing this plan, were there no other objection to it; should it appear, however, that if adopted it would not answer the intended purpose, this must be fatal to it, and such we unhesitatingly say would be the fact. The motion of the water in the boiler would keep the valve in a state of constant agitation, whenever it descended near to the point at which the valve should open; nor would the steam ever pass off in a stream sufficient to set the engine at work which is to operate upon the force pumps; and were it possible to set it in action, it must stop the moment the valve closed, and thus continue perpetually starting and stopping. Every practical engineer will, we apprehend, concur with us in pronouncing the scheme altogether fanciful.

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39. For an improvement in *Making Glass Knobs;* Spencer

Richards, Cambridge, Middlesex county, Massachusetts, October 31.

The improvement here patented is the insertion of a brass nut in the body of the knob, with a hole leading to it from the lower part. Into this nut a male screw may afterwards be passed, by which the knob may be fixed to drawers or shutters without the use of a tapped nut. In the common way of making knobs, a hole is left entirely through them, and the shank by which they are fastened, has its head on the top of the knob; by the present method, the top of the knob is whole, the perforation extending no further than to allow the screw shank to pass into the nut.

Pressed knobs have been frequently made with screw shanks imbedded in them, but they are apt to break the knob, an objection which will probably be removed, or much lessened, by inserting them into a nut in the manner proposed.

ENGLISH PATENTS.

To John Burgis, *ornamental paper manufacturer, for his new invented method, or methods, of gilding, or silvering, certain woven fabrics in burnished, or burnished and dead, or matted gold or silver, and which said fabrics may be used as gold or silver, and lace borderings, and for other purposes. Sealed 5th February,* 1829.

The very great expense of gold and silver lace, has induced the patentee to invent a simple and cheap mode of manufacturing an imitation of that costly material, which he proposes to employ in decorating curtains, chairs, and other articles of household furniture. The material to be employed is fine cotton or other cloth, upon which a coating of gold or silver leaf is to be laid, by the ordinary process of gilding and silvering. The cloth is then to be cut into narrow strips, and wound round cords to resemble cords of gold, which cords may then be plaited or otherwise woven into lace of various kinds. The cloth about to be operated upon, is first dyed, (if for gold, of an orange or yellow colour.) It is then to be stretched out upon a flat surface, and covered with a coating of size, made of parchment shavings, in the same way that gilder's size is commonly made. When dry, the reverse side of the cloth is to be sized in the same way.

After this preparation, two or three coatings of the material called gold size is to be laid upon that surface of the cloth which is intended to be guilt; this size being made of gelatin, with pipe clay and ochre, or other yellow colour. When the materials have become perfectly dry and hard, the surface is to be polished smooth, and all hairs or small pieces of grit removed.

The cloth being tightly distended upon a flat surface, is now to be sponged over with water, and then the leaf gold laid on smoothly with a gilder's camel hair brush, taking care that all the fractured parts of the gold leaf are afterwards carefully covered with fresh pieces of gold leaf, so as to leave no parts of the surface ungilt.

When the gilding has become perfectly dry and hard, the cloth may be passed over a roller, and brushed, for the purpose of burnishing its surface; and if it has been gilt on both sides, that part of the cloth which is undermost should be carefully covered with paper, to protect it from injury while under the operation of the burnishing brush. But when dead gold is required, then the burnishing brushes may be dispensed with.

The cloth having been thus gilt, is then to be cut into strips of any required width, in a machine, with knives or shears, placed at suitable distances, in order that the strips may be perfectly parallel. These strips are then to be wound or bound round cords of suitable thicknesses, the cords having been previously dyed of an orange or yellow colour; and the cords, after having been so covered with the gilt cloth, may be twisted together to represent bullion, or in any other way plaited or woven in the manner that gold lace is commonly made. Precisely the same operations are to be performed in the preparation of silver lace.

This artificial gold or silver lace may be applied as cording or bindings for the edges of chairs, sofas, &c. or for the fringe of curtains and other drapery. [*Lond. Jour.*

To THOMAS, WILLIAM, *and* JOHN POWELL, *of the city of Bristol, glass merchants and stoneware manufacturers, for their invention of certain improvements in the process and machinery, or apparatus, for forming, making, or producing moulds or vessels for refining sugar; and in the application of materials hitherto unused in making the said moulds. Sealed 17th May,* 1828.

THE patentees propose to make the conical moulds, or vessels, in which refined or loaf sugar is moulded from stoneware clay, and to glaze them both within and without.

In the first instance, the stone ware clay is to be prepared in the usual manner, and is then to be put under a press, for the purpose of bringing it into a sufficiently stiff and compact consistency. In the bottom of the vessel in which the clay is pressed, a mould is placed. consisting of a flat board, with a broad conical aperture cut out of its centre. In this aperture of the board the clay is to be shaped which is to form the vessel.

As the board lays flat under the press, the clay will necessarily be forced into the recess, or aperture; which being done, it is then cut off level from the clay which is above it, by passing a wire or string, or thin cutting blade over the surface of the board, which leaves the portion of clay thus moulded in a thin slab of a broad conical form.

This slab of clay, while in its plastic state, is then placed round a conical block, so as to cover the block perfectly, and any small defects which may be left at the junctions of the edges of the slab, are to be made up with small portions of clay, laid on with a spatula or palette knife.

The block is now set in a convenient situation, where the coating of clay may be dried by the air; and when it has become completely dry, the block is fixed upon a rotary spindle passed through its axis, and the outside of the clay vessel is turned perfectly smooth in the same way as stoneware articles are usually made.

The shell of clay being then slipped off its block, will be found to be an accurately formed conical vessel, having a small hole in its apex, and suited for the purpose of a sugar mould, perfectly smooth both within and without.

Any number of these conical vessels may then be placed upon their bases side by side, in an oven, for the purpose of being baked, and they are to be glazed within and without by salt, as clay stoneware is usually glazed. [*Lond. Jour.*

To JOSEPH CLISILD DANIELL, *Clothier, for certain improvements applicable to the manufacturing and preparing of Woollen Cloths. Sealed 5th August,* 1828.

THERE are two objects proposed under this patent: the first is designed to preserve a uniform tension in the warp threads of a cloth loom; the second, to give additional force to the beaters of a stock for fulling cloth.

In the first instance, the loom is not intended to be altered in its general construction from ordinary looms for weaving cloth, but there is affixed to the end of the warp roller a pulley, over which a weighted cord is passed for the purpose of drawing the warp tight, and at the same time allowing it to be given out as the batten beats up the work. A similar pulley is also attached to the end of the work roller, with a weighted cord passed over it in the opposite direction to the former, in order to draw up the work. Hence the warp threads are always kept at a uniform tension, and when any additional force is exerted as in beating up, a small portion of the warp only is given out, by the roller slipping round under the weighted cord.

The second feature of the invention applicable to fulling stocks, is designed to supersede the present mode of allowing the beaters to fall from a height by their own gravity, and to effect the beating and milling of the cloth by their descent. Instead of this it is proposed to raise the beaters but a short distance up from the cloth in the cell of the stock, and to give forcible effect to their descent by means of powerful springs acting at the back of the arms of the beaters.

The adaptation of springs to the backs of the beaters, for the purpose above stated, may be effected in various ways, and by several kinds of springs, all of which the patentee claims as coming under his invention, and the advantages anticipated are that considerable time may be saved in the performance of the fulling or milling process, by shortening the stroke of the beaters, which will allow of a much more frequent repetition of the blows than when the beaters are allowed to fall from a height; and the power of the spring upon the improved plan may be made to give an equally effective blow to that produced in the ordinary stock by the descent of the beaters from gravitation. [*Lond. Jour.*

Specification of the patent granted to Robert Stephenson, *Engineer, for an improvement in the Axles and parts which form the bearings at the centre of Wheels for Carriages which are to travel upon edge Rail-ways. Dated March* 11, 1831.

To all whom these presents shall come, &c. &c. *Now know ye,* that in compliance with the said proviso, I, the said Robert Stephenson, do hereby declare, that the nature of my said invention, and the manner in which the same is to be performed, is particularly described and ascertained as follows, (that is to say):—

My improvement in the axles and parts which form the bearings at the centres of the wheels for carriages which are to travel upon edge rail-ways, consists in fixing two of the said carriage wheels fast upon the extreme ends of a long, hollow or tubular axis, within which a solid central axis is inserted, extending through all the length of the hollow, and projecting out sufficiently beyond each of the hollow axes to enable the weight of the carriage to be supported upon the projecting ends of the solid central axis, around which the hollow axis turns, together with the two wheels which are both fastened, (as aforesaid,) upon the ends of the hollow axis.

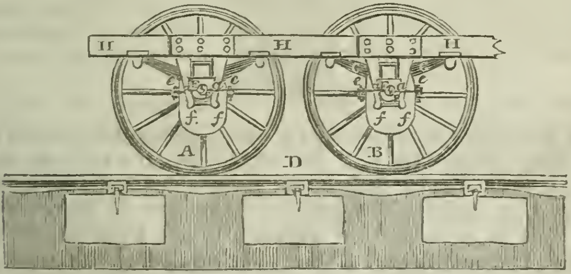
In the carriages now used upon the Manchester and Liverpool Rail-way, each pair of wheels are fixed fast on the two opposite ends of a long solid axis, which revolves with the wheels, and the two extremities of the solid axis which project out through the centres of the wheels, are formed into pivots or gudgeons, and are received in suitable sockets, whereon the weight of the carriage is borne by the hollows or concavities of those sockets pressing downwards on the pivots. In travelling with great rapidity, the said pivots require a copious supply of oil, much of which is wasted, because the hollows or concavities of the sockets, (which do not revolve,) are inverted, in order that they may bear downwards upon the upper parts of the circumferences of the revolving pivots of the axis; consequently, the oil has a tendency to run down and escape from the places of bearing where it is wanted. According to my improvement, it is the central axis which does not revolve; and it is the lower parts of the circumference thereof which apply and bear downwards within the hollows or concavities of the hollow axis, which does revolve around that central axis; consequently, the oil has a tendency to run down into the places of bearing where it is wanted; the action thereof being (in that respect,) the same as in the axles and boxes of common coach wheels, wherein the axle does not turn round, but the box in the centre of the wheel turns round about the axle.

For travelling on edge rail-ways the wheels on the opposite sides of the carriage require to be firmly united, so that they will turn round together in pairs, in order to prevent one wheel from advancing either faster or slower along one rail than the other wheel advances along the other rail. On the common plan of coach axles and boxes, the wheels of each pair being quite independent one of another, one wheel can turn round without the other wheel; and hence such axles and boxes are unsuitable for the wheels of carriages which are to travel upon edge rail-ways; and hence the mode above stated has been introduced; videlicit, that of fixing each pair of wheels upon a solid axis, which turns round with them, and compels them both to go together: according to my improvement of fixing the two wheels upon the extreme ends of a long hollow or tubular axis, as aforesaid, the pair of wheels are firmly united together, so that one wheel cannot advance more along one edge rail, than the other wheel does along the other rail; and that circumstance, (which is an important condition for travelling with safety and rapidity on edge railways) is combined with the advantage of the ordinary coach wheel axles, in respect to their supply of oil; videlicit, that the bearing of the solid axis which does not turn round, presses downwards into the hollows or concavities of the hollow sockets, which turn round with the wheels, giving the oil a tendency to insinuate itself between the bearing surfaces.

Description of the drawing.

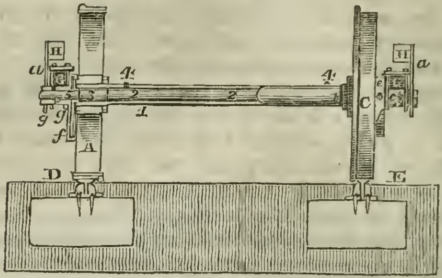
The drawing hereunto annexed, represents so much of a carriage which is to travel upon an edge rail-way, as is necessary to explain my improvement. Fig. 1 is a lateral elevation of a four wheeled

Fig. 1.



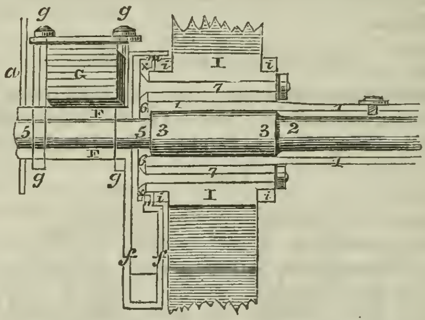
carriage, suitable for conveying goods on an edge rail-way, showing the two wheels A B, which follow each other along the same rail D of the rail-way. Fig. 2 is a transverse section, answering to fig. 1, and showing one of the pairs of wheels A C, which are at opposite sides of the carriage; one running on one rail D, and the other on rail E.

Fig. 2.



The pair of wheels must be united together, as before mentioned, and that is done by means of the long hollow or tubular axis 1, 1, the two ends of which are inserted and firmly fastened into the central holes of the two wheels A C, so as to keep them at the proper distance apart, to suit the space between the rails D E, and to keep them firmly vertical when they turn round. One of the wheels A is represented in section, as if it were cut through the centre by a vertical plane, to expose the interior parts, and that section is repeated on a larger scale in fig. 3. To explain the structure of the parts, 2, 2, is the centre of the solid axis which passes through the interior of the long hollow axis 1, 1, but which central axis does not turn round. It is enlarged a little at the parts which form the cylindrical bearings 3, 3, which are contained within each of the ends of the hollow axis 2, 2, where the wheels A C are fixed on the outside thereof. The middle part of the solid axis being rather smaller in diameter than the cylindrical bearing parts 3, 3, a space is left vacant all round the solid axis, within the hollow axis, to contain a stock of oil. When that stock requires to be renewed, a supply of

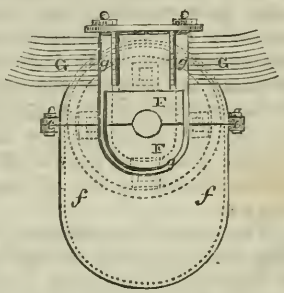
Fig. 3.



fresh oil is poured into the vacant space through two holes at 4, 4, which are then stopped very tight by screw plugs. When the carriage is in use, the oil makes its way from the middle part of the hollow axis, towards each end thereof, where the bearings are, and thereby the bearing surfaces are kept constantly supplied with oil. The ends of the central axis, which project out beyond the ends of the hollow axis, are also smaller in diameter than the cylindrical bearing parts 3, 3, as shown at 5, fig. 3.

The weight of the carriage is supported upon those projecting ends 5, each of which is for that purpose received in a socket F F, made in two halves screwed together, as shown in fig. 4 and in fig. 2, by four small bolts, *e*, *e*, and also by the two staple bolts *g*, *g*, which fasten the springs G down across the upper flat sides of the socket F; and the pressure of all those screws binding the two halves of the said socket F firmly together, around the end 5 of the solid axis, fastens the socket to the axis. The outer end of the socket F is fitted into a vertical groove, formed in the space between the two prongs *a*, *a*, of a forked plate of iron, which is screwed to the horizontal side rail H of the carriage, as shown in fig. 1, and projects downwards therefrom. The ends of the springs G apply to the underside of the side rails H, and bear the weight of the carriage; the middle parts of the springs being borne upon the socket F, to which they are fastened, as before stated: and when the springs bend, (by the jolting motion of the carriage in passing over the joinings of the rails, or other uneven places,) the sockets F rise and fall in their vertical grooves *a*, *a*. To confine the hollow axis with the wheels from having any unnecessary end play on the solid axis, circular plates or rings of metal are fastened one against each end of the hollow axis, being bolted fast to the flat surfaces of central bosses or naves I of the wheels; and those rings having small circular projections, which enter a little way into the ends of the hollow axis, (as shown at 6, fig. 3,) those projections apply to the shoulders, which are formed on the solid axis by the enlargements 3, 3, which form the cylindrical bearings thereof.

Fig. 4.



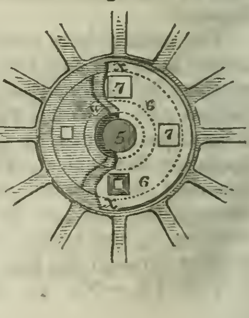
The central hole through each of the rings 6, is only just so much larger than the end 5 of the solid axis, as to allow of a free turning motion; but the central projection which enters into the end of the hollow axis, is fitted very tight therein. A large washer of leather is interposed between the flat surface of the ring 6, and the corresponding flat surface of the central boss or nave I of the wheel; and the ring 6 is bound fast thereto by screw bolts 7, 7, which pass through the boss I of the wheel, having their heads countersunk into the ring 6, and having nuts screwed on their opposite ends, which project through the boss of the wheel.

The ring 6, with the leather washer, prevents any oil getting out, except that which makes its way between the central hole of the ring 6, and the end of 5 of the axis; and in order that the oil which so makes its way may not drip away or run down the arms of the wheel, and get to the rails, or be lost, a hollow oil box *f f*, is provided to receive and save the oil which escapes. The said box is cast in the same two pieces with the socket F, before described as being in two halves; when they are put together, the oil box *f f* clasps around the outer end of the nave I of the wheel; and the circular rim *x* of the ring 6 projects beyond the flat surface of the nave I, against which it is fastened by the bolts as aforesaid; and the part *x* so projecting, being opposite to the flat surface of one of the circular hoops *i*, (by which the nave is bound and strengthened,) forms a circular groove around the circumference of the nave I, into which groove a corresponding interior rim *m*, *m*, of the oil box, projects and interlocks, in the manner shown in the section; and without touching at any part, the interlocking prevents the escape of the oil, or the entrance of dust into the oil box; but all the oil which makes its way out of the hollow axis will be caught in the oil box, from whence it may be drawn off through a suitable plug hole or tap cock at the bottom of the oil box, when a quantity has accumulated therein.

The form of the oil box *f f* is fully explained by figs. 2, 3 and 4. The solid axis 2, 2, is made of wrought iron of competent strength to bear the load that the carriage is to convey. The dimensions represented in the drawing are adapted for a carriage of four tons weight when loaded, (being one ton bearing upon each wheel.) Figs. 1 and 2 are drawn to a scale of one-eighth of the real size; and figs. 3, 4 and 5, are one-half of the real size.

The carriage is represented with wheels three feet diameter, made of cast iron in one piece, and surrounded with wrought iron tires to run upon the rails; also with wrought iron hoops surrounding the projecting ends of the nave, to prevent splitting. The wrought iron tires and hoops are applied in the usual manner when hot, that they may shrink on the cast iron in cooling, and bind the same very tight; the outsides of the tires are turned true, and the central holes through the naves are bored truly cylindrical. The ends of the hollow centre axis are turned true on the outsides, to fit tight into the holes through the wheels; and when inserted they are secured by driving in a key, which is fitted into a hole previously cut in the joint, so that one half of the thickness of the key lodges in the cast iron nave, and the other half in the wrought iron hollow axis—see w, fig. 5. The extreme ends of the hollow axis conform with the flat surfaces of the naves of the wheels, in order that the flat surfaces of the rings 6, with their leather washers, may apply to both.

Fig. 5.



The hollow axis is made of wrought iron, welded in the manner of gun barrels; an extra thickness is given at each end, where it is to be fitted into the wheels. The inside of the hollow is bored out truly cylindrical at each end, where the bearing parts, 3 3, of the solid axis, are to fit into it; those parts are turned truly cylindrical, and may be case hardened, as well as the interior of the hollow axis at the bearing parts, and also the projecting central parts of the ring 6. Note.—These projecting parts enter so far into the hollow axle as to leave very small vacant spaces between them and the shoulders of the central axis, and to allow about a quarter of an inch end play to the wheels along the solid axis.

Many of the parts hereinbefore described, admit of being differently constructed, without any departure from my invention. Wheels of wood, with cast iron naves, may be substituted for those represented in the drawing. The hollow axis may be made of cast iron, if a suitable increase of metal is given to make up the same strength. The ends where the bearing parts of the solid axis are to fit into the ends of the hollow axis, may be lined with brass, or with bell metal, inserted and fixed in. The ends of the solid axis may be fitted into its socket F, so as to be at liberty to turn freely round therein, instead of being held fast, as before described. The use of that will be that the axle may turn round with the wheels, in case it has been neglected to give a due supply of oil to the hollow axis, before setting out on a journey; and that in consequence the fitting parts thereof become bound together during a journey. A narrow groove may be cut in the cylindrical surface of each of the bearing parts of the solid axis, winding spirally round the same, in order to assist in conveying the oil to all parts of the length of the bearing.

Having now described my said invention, I do hereby declare, that what I claim as my improvement in the axles and parts which form the bearings at the centres of wheels for carriages which are to travel upon edge rail-ways, is the combination hereinbefore described, of those parts which are marked in the drawing, with numeral characters for reference in the foregoing description. That combination being made for the purpose of causing the bearings of the solid axis, (which does not turn round,) to press downwards into the concavities of the hollow axis, which does turn round with the wheels; and which hollow axis connects the two wheels together, so that one cannot turn round without the other. And I make no claim to the said improvement, except in its application to carriages which are to travel upon edge rail-ways.

In witness whereof, &c. [*Rep. Pat. Inv.*

Specification of a patent granted to GEORGE STEPHENSON, *of Liverpool, engineer, for an improved mode of making wheels for Rail-way carriages. Dated April* 30, 1831.

To all whom these presents shall come, &c. &c.—*Now know ye,* that in compliance with the said proviso, I, the said George Stephenson, do hereby declare, that my said invention is described and ascertained in manner following, (that is to say):—

My said improved mode of making wheels for rail-way carriages, consists in forming the same with a suitable number of hollow tubes of thin wrought iron to form the spokes, arms, or radii of such wheels; which tubes after being prepared at their ends (in the manner hereinafter described,) with borax, to serve as a flux to the wrought iron, are laid in proper radiating directions, into a mould formed of sand, in a suitable manner, to receive melted cast iron; which cast iron being poured into the central cavity of the said sand mould, will surround and attach to the inner ends of all the wrought iron tubular spokes, at the parts where the said preparation of borax has been previously applied thereto, and thus a nave or centre piece of cast iron, will be formed for the weel; and also melted cast iron being poured into the other cavities of the said sand mould, will surround, and attach to the outer ends of the same spokes, at the parts previously prepared with borax; and thus the circular rim or felly of the wheel will be formed in cast iron: and that felly is afterwards to be surrounded with a strong wrought iron tire or hoop which is applied when hot, around the cold cast iron, so that it may shrink or contract thereon in cooling, in order to firmly unite and bind all the parts of the wheel together: and lastly, the outer edge of the said tire must be suitably turned and formed to run on the rail-way.

And whereas, wheels for rail-way carriages have been commonly made under a patent granted to William Losh and myself, in the year 1816, with spokes of wrought iron of various forms, (but not hollow tubes,) and with cast iron naves and rims formed and united to the ends of the said wrought iron spokes, by running melted cast iron into suitable moulds formed of sand, the said cast iron surrounding and attaching to the ends of the said wrought iron arms, but without any previous preparation for those ends, with borax to serve as a flux; and also the wheels as formed, have of late been hooped with wrought iron tire.

I do hereby declare, that I confine my claim of invention under the present patent, (for my improved mode of making such wheels for rail-way carriages,) to the substitution of hollow tubes of wrought iron for spokes, in lieu of the solid bars of wrought iron heretofore used for spokes, and to the application of a preparation of borax as a flux, (in the manner hereinafter described,) to the ends of such hollow tubular spokes, previously to placing them in the sand mould, and to running the cast iron round them. The said hollow tubes for spokes, at the same time that they are stronger in proportion to their weight than solid bars for spokes, will hold more securely in the cast iron of the nave, and of the rim, because the cast iron running into the hollows at the ends of the tubes, as well as around the outsides of the tubes, obtains a much greater surface of contact with the wrought iron, than heretofore obtained with solid arms; and also the end of each wrought iron tube being an extended surface of thin metal, that metal becomes very highly heated by the melted cast iron, when the same is poured into the mould, and flows round the thin wrought iron on both sides, (namely, inside and outside of the end of the tube:) and in consequence of the previous application of borax to the said ends of the tubes, both inside and outside thereof, the borax acting as a flux to the wrought iron, the heat of the melted cast iron causes the same to unite and adhere very firmly to the wrought iron; and hence, by my improved mode, very strong wheels can be made for rail-way carriages, which strong wheels have hitherto been a desideratum for carriages, to convey passengers and goods with that great rapidity of motion which is practised in travelling on the rail-way between Liverpool and Manchester; for the violence to which the wheels of the carriages are subjected in such quick travelling, is so great that no wheels hitherto tried on that rail-way have been found sufficiently safe and durable.

Wheels of cast iron, with wrought iron tires, are found liable to crack and to fly in pieces without any warning, and hence are dangerous for passengers; and wheels made with solid arms of wrought iron, with naves and rims of cast iron, run around the ends of wrought iron arms, (without the aid of borax as a flux:) but, according to the patent granted to Mr. Losh and myself in 1816, although hooped on the outside with wrought iron tires, are found very liable to work loose at the junctions of the wrought and cast iron; and hence, wheels with cast iron naves and wooden spokes and fellies, surrounded with wrought iron tires, have been preferred for the carriages to convey passengers on the aforesaid rail-way; but such wooden wheels wear out very fast, and require continual repairs; and wheels made according to my improved mode, will be found more durable and safe.

And for the more full explanation of my said improved mode of making weeels for rail-way carriages, I have hereunto annexed a drawing, representing two wheels which are made according to that mode.

Description of the drawing.

Fig. 1.

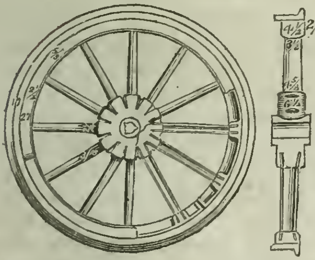
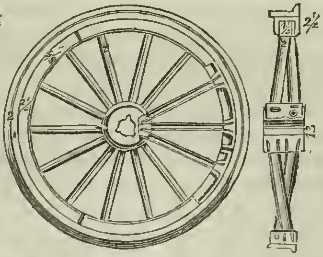


Fig. 2.



The wheels in figs. 1 and 2 have twelve hollow spokes of thin wrought iron, each one being made by turning up a piece of iron plate, of a suitable shape, size and thickness, into the form of a tapering flattened tube, with overlapping edges, which edges are welded together on a mandril, in the same manner as gun barrels are made, except that the tubes are of a flattened oval form, as well as tapering, as is clearly shown in the drawing. The said tubes are enlarged a little at each end, in the form of a trumpet, or bell mouths, and are prepared for casting the cast iron naves and rim around the ends of them, by carefully cleaning the ends inside and outside from all dirt and loose scales, and then applying a thin glazing of borax to those ends, either by dipping the ends of each tube in water, and sprinkling the wetted parts with powder or dust of pounded borax, so as to cover the surface of the iron, inside and outside of the tubes with borax, nearly as far as the cast iron is intended to join to the wrought iron; and the said ends so covered with powdered borax, are then to be heated by holding them in the flame of an oven or hollow fire, until the borax becomes fused, and flows upon the surface of the wrought iron, so as to cover the same with a thin glazing or coat of borax; or otherwise, borax may be melted in a suitable crucible or pot: and the aforesaid ends of the tubes being heated and dipped into the melted borax, will become covered with a thin glazing or coating of borax, as aforesaid. Note.—The hollows of the said tubular spokes should be filled up with sand, except at so much of the ends thereof as are intended to have the cast iron run into the said hollows; and likewise one or two small holes should be previously drilled through the iron of each of the oval tapering tubes, in order to let out the air which might otherwise become confined within the hollows thereof, when the cast iron is run around their two ends.

The mould for casting the iron nave and rim, is formed by the aid of a wooden pattern or model, of the same size and shape as the intended wheel, with its central nave, arms and rim complete; the pattern being made in two or more thicknesses, which separate or take apart, as may be requisite: and the mould being formed of sand, rammed hard into two boxes, which separate and take apart in the usual manner practised by iron founders for casting wheels in sand, with moulding boxes and wood patterns; and when the pattern is withdrawn from the sand, leaving the cavity or mould therein, the hollow tubular arms of wrought iron, (prepared as aforesaid,) are laid into those cavities of the mould, which were left by the arms of the wood pattern, with those ends of the said hollow iron tubular arms which are prepared as aforesaid, with a glazing of borax, projecting into those cavities of the said mould, which were left by the central nave and by the circular rim of the wood pattern, so that when the melted cast iron is poured into the remaining cavities of the mould, it will run around and into the said ends of the hollow tubular arms, where the same are glazed with borax, and will surround the same, both inside and outside of the hollow tubes, whereby the melted cast iron will heat the thin wrought iron, of which those tubes are formed, to such a degree, as by the fluxing action of the borax, will cause a very firm union to take place between the ends of the wrought iron tubes, which form the arms of the wheel, and the cast iron which forms the central nave and the circular rim thereof.

Figs. 3 and 4 of the drawing represent another wheel, made according to my said improved mode.

The arms or spokes, which are fourteen in number, are cylindrical tubes of wrought iron, instead of tapering flattened tubes; and they are not situated in a plane, but one half of the number are dished towards one side of the wheel, and the intermediate seven spokes are dished towards the other side of the wheel, to give greater lateral strength thereto. In every other respect the construction of this wheel is the same as that of figs. 1 and 2.

Note.—It will be necessary to insert three cores of dry sand across that cavity of the said mould which is left for casting the circular rim of the wheel, whereby the said rim, when cast, will be formed in three distinct segments, with small intervals between the ends of them, in order to allow for that contraction of the cast iron which must take place, in cooling, from a fluid state, till it becomes cold.

The intervals between the said three segments are afterwards filled up with iron keys, accurately fitted therein, and they may be fastened by riveting, if necessary; and thus a wheel with a firm circular rim is formed; and around that wheel, the wrought iron hoop or tire is applied when hot, that it may contract or shrink, and fasten upon the cast iron rim in cooling.

Note.—The cast iron rim of the wheel may be cast hollow, as represented in the section, by placing dry sand cores in the mould in proper positions, to occupy the middle part of the cavity left by the circular rim of the pattern, according to the mode usually practised by founders in like cases.

It is needless to enter into any farther description of the mode of moulding, or casting such wheels, because all competent iron founders are accustomed to such operations; and because my improved mode of making wheels for rail-way carriages, consists merely in the use of hollow wrought iron tubes for the spokes of such wheels, and in preparing the ends of such hollow tubes with a glazing of melted borax, applied inside and outside, at all the parts which are intended to join to the cast iron, in order that the borax may act as a flux to the wrought iron, to cause it to unite firmly to the cast iron, which is run or cast around the ends of the said hollow spokes, to form the central nave and the circular rim of the wheel. The dimensions of the wheels represented in the drawing, may be found by measuring from the scale; they are five feet diameter, and are adapted for the wheels of a locomotive steam engine, which weighs eight tons; the wheels being turned round by the power of the engine, in order to advance the engine along the rail-way. Wheels for other kinds of rail-way carriages may be made according to the same drawings, by apportioning their dimensions to the purpose for which they are intended, and with strength corresponding to the load they are required to carry.

In witness whereof, &c. [*Ib.*

Patent granted to THOMAS COLEMAN, *of St. Albans, in the county of Hertfordshire, training groom, for an improved roller for horses. Dated March* 29, 1831.

THE dangerous consequences resulting from tight lacing, so frequently insisted upon by our medical men, and so little heeded by the fair objects of their solicitude, have, at all events, produced one benefit—that of releasing one of the most elegant, attached, and useful creatures under heaven, (woman excepted—when she has a waist of natural dimensions,) from the like pernicious treatment.

Mr. Coleman, being a rational person, and a man of observation, has discovered that the rollers in common use for horses, (for those more especially that are required to exert their speed,) being formed of a stubborn, unyielding material, have the effect of compressing the ribs, consequently of contracting the room in which the lungs perform their function, and, in the end, of rendering the animals liable to be injured in their wind.

The earlier in life these rollers are girded on—and very young colts, when they are of gentle blood, as with young ladies of the like heraldic standing, are submitted to the discipline—the more easily, of course, is the injury incurred. To obviate which, our patentee proposes providing the rollers for the horse cloths with elastic springs, flat in form, of hardened steel, upon a similar principle to elastic garters or braces. This improvement, he says, will answer all the purpose required, of confining the body cloth, at the same time that it will allow full liberty of action to the young animal's lungs.

[*Ib.*

Patent granted to THOMAS WESTRUP *and* WILLIAM GIBBINS, *both of Bromley, in the county of Middlesex, gentlemen, for improvements in converting salt or other water into pure or other water. Dated May* 24, 1831.

THE "improvement" to which these patentees lay claim, consists—first, in encircling the usual boiler appended to a ship's cooking apparatus, with another boiler destined to contain the salt or impure water which it is desirable to convert into pure liquid, fit for culinary or other domestic purposes. The steam arising from this passes through a worm pipe that is enclosed in a cylinder, situated between the decks of the ship, and *below* the water line. In the upper and lower parts of this cylinder are tubes communicating with the external water. As, therefore, it is the property of heat to ascend, the lower pipe will constantly receive a stream of cold water, while the heated water will pass out through the upper tube. The reader need not be informed that the condensed steam in the worm pipe, passes through the bottom of the cylinder into a receiver.

The patentees have added a more simple and economical mode than the above, of condensing the steam; which consists in passing the condensing pipe over the bows of the vessel by the side of the keel, (where it will be at little risk of injury from contusion,) and reintroducing it at a convenient distance below the water line.

Having thus described the principle of the patent, it is unnecessary to add, that so long as there is a fire in the kitchen range, and water in the boiler, no other labour or attention is requisite for the purpose of obtaining a constant supply of that purest of all liquids, distilled water. [*Ib.*

FRENCH PATENTS.

Patent granted to Messrs. VICTOR FOUGERE, *Bronze Manufacturer*, HERARD DE VILLIERES, *Varnish Maker, and* EMANUEL MEUNIER, *all of Paris, for a decoration upon Brass*, Manheim, *or Gilding; imitating Mother-o'-Pearl, burnished Gold, dead or bright Silver, &c.*

THE instructions for preparing the above decorations are, to take a plate of brass, copper or *manheim*, bite it with aquafortis, then burnish, and afterwards cover it with what is known in the trade under the name of common or simple varnish (*petit varnis:*) add to this liquid $\frac{1}{10}$th of copal varnish, and $\frac{1}{20}$th of essence of distilled turpentine. When the plate is thus overlaid, it is dried in the air for two or three days, and bitten until the bright metal not decorated, becomes dead. When the brass is thus prepared, it is silvered with the following preparation:—

Composition for silvering unpolished brass, and mode of using it.

Dissolve in a pound of aquafortis an ounce of virgin silver: when it is thoroughly dissolved, it is precipitated with a quarter of a pound of fine salt, dissolved in a half pint of water. The residue of this precipitation is washed in ten different waters, after which it is mixed with two lbs. of cream of tartar, and two pounds of purified salt, and made into a paste slightly liquid. With this composition the brass is silvered, observing the neatest precision, and rubbing the plate with a fine linen until it be completely covered, and present a perfect dead surface.

The plate having been thus silvered, it is cleansed in fresh water and thoroughly dried; when the size is diluted with essence of turpentine till the metal becomes brilliant, after which it is covered with the composition known by the name of *English* varnish.

For an imitation of burnished gold in a bronze ground, the same preparatory steps already described, are taken. When the size is dry, it is bitten, and afterwards bronzed in the following manner:— A copper farthing is dissolved in an ounce of aquafortis: with this is mixed a gallon of vinegar, two drachms of salt of nitre; and with a hair pencil the plate is covered till the whole be equally bronzed; after which the size is diluted, and the varnish laid on, as already described.

Decoration of a bright or dead silver on a bronze ground.

The brass or copper plate is silvered dead or burnished, and decorated as has been already described. The silvered brass, not decorated, is reduced to the state of dead, or unpolished brass, by biting. It is then bronzed, diluted, and varnished as detailed above.

Decoration of brilliant silver on a dead ground of the same.

The brass or copper plate is silvered, burnished and decorated as before described. When the decoration is dry, the plate is slightly bitten, and the dead, or unpolished character, is given to it as in the first description.

These decorations may be interlocated by colours of every description. [*Ib.*

Patent granted to Monsieur Bastier, *of Paris, for a process of culture, bleaching, and platting Straw, destined for the manufacture of Hats, from what is termed Italian Straw.*

Cultivation of the Plant which furnishes the Straw.

The plant which supplies the straw calculated to make the hats from what is termed Italian straw, is a species of wheat known in Tuscany under the name *Marzajolo grano gentile rosso*, (triticum asticum, trimenon;) however, any other species of wheat will answer the purpose, since all are but modifications of the same primitive plant from the culture of different soils, in different climates: all depends then upon the mode of cultivation, the choice of soil, upon its exposure, temperature, &c.

The ruling principle in this cultivation consists in making every thing bear, upon obtaining a frail, attenuated, and hunger-starved plant—in fact, to degenerate it: thus in the management of it, the object is to produce a precisely opposite result from the one commonly sought. The end of ordinary cultivation is to produce a strong plant, vigorous, and well seeded: in the present instance, the most feeble and meagre growth is the point of perfection, the grain not being a desideratum.

The soil then should be extremely poor and sandy; upon lofty elevations, and amid flints and pebbles, this wheat is most favourably produced.

The preparing of the ground is the same as for other descriptions of corn, with the exception that no manure is laid upon it. In Tuscany they till very lightly: the grain is sown in autumn or in spring, but more commonly in autumn, because the straw is reaped more early, and the preparation for the manufacture may be entered upon more promptly; for if the straw be laid by from year to year, it will not bleach so favourably. It is requisite to sow thickly, for the grain comes up, in consequence, more slenderly, and, of course, in more considerable quantities. It is unnecessary to allude to weeding, or the other duties requisite in agriculture.

As soon as the stalk has gained sufficient strength, which may be easily proved by breaking it, it is reaped. This moment varies between the blossoming of the grain and its full maturity, according to the quality of the seasons, soil, &c. The straw of the wheat that is suffered to ripen for seed, serves for the coarser description of hats. As the plant is naturally short, it is plucked up in order that its length may not be curtailed by cutting it with a sickle or scythe.

When the plants are gathered, they are collected in small sheafs of three or four handfuls, and allowed to remain as many days upon the ground: the dew assists in the bleaching: but if the weather threaten rain, they must be quickly housed, for if they be wetted, they will be spoiled, and rendered unserviceable for the purpose intended—at least in the manufacture of white hats.

This mode of cultivation is of course susceptible of many modifications, according to the nature of the soils, their situation, the temperature, climate, &c. it would be as tedious as useless to enter into detail on this head; the main points being laid down, they will be found sufficient for every one who possesses any experience in agriculture.

Making of the Hats.

The straw being gathered, it is requisite to separate that part which is to be employed in the manufacture of the hat, that is, the upper part, from the first knot to the ear. This operation it is less difficult to perform than to describe. When separated, it is collected into small bundles, and the process of bleaching commences, which is accomplished in the following manner:

The straw is put into a large wooden chest, until it be filled, with the exception of the centre, that is reserved for a chafing-dish, lighted: the lid of the chest is closed as closely as possible, and in this state it is suffered to remain three or four days. No metal must be used in the making of this chest.

The straw being bleached, it is picked and culled, in which operation the spoiled, rank, and too large stalks are rejected; and the different qualities of straw, to the number of sixty, according to their delicacy, are separated; and of these, sixty qualities of hats are manufactured.

When picked and sorted the platting commences. This art is easily learned, and need not be described. Suffice it to say, it differs not from the ordinary mode in the common straw hats. The platting is begun with five straw threads, and gradually increased to nine, until the whole of the bottom of the hat be finished, and thus they continue the whole. The platting being completed it is sowed, after previously cutting off the projecting straws. The sowing of the plats is made upon a form, of which they take the figure. The sewing, which should be managed so as not to expose the threads, is effected by passing the needle under the straws in the platting. The rim of the hat should be from time to time withdrawn during the sewing, to prevent its becoming distorted. It is commonly by the number of rows or plats composing the rim, that the fineness of the hat is distinguished; since this rim being of a settled dimension, the finer the plat, the more material is included in the plat. The straws that exceed the level of the plats are again clipped with scissors.

The hat being completed, it is polished, calendered, and bleached: before it is calendered, and after having been fumigated with sulphur, the straws which have too yellow a hue, or are otherwise defective, are removed: the vacancies also in the plats are filled up. The straws are removed by needles and scissors; and the vacancies are supplied by means of a needle threaded with a straw. The hats are smoothed with polishers, passing them uniformly the same way; which instruments are commonly made of box wood, of a wedge form, with a single handle, uniting at its base.

They are calendered with a long heated iron of about fifteen pounds weight, passing it also the same way over the plat.

The fumigation by sulphur is performed before the hats are either polished or calendered, and in the same chest in which they were first bleached; being previously slightly damped; and they are allowed to remain in the vapour from twenty-four to seventy-two hours. Finally, those of an inferior quality or colour are dyed black.—*Brevets d'Inventions.*

Patent granted to FRANCIS DODEROT, *Embroiderer, Paris, for the employment, in embroidery, of transparent and opaque cuttings of Quills, of Tortoise-shell, and of Whale-bone.*

THIS invention consists in embroidering with spangles made of quill, tortoise-shell, and whale-bone, as they have hitherto been manufactured of steel. The above materials, varied under an infinity of different forms, and shaded in every colour, produce a more airy decoration, it is less liable to accident, and is more agreeable to the eye than any hitherto known.

Two improvements have been added to this invention; the one, that of rendering the quill of so brilliant a white as to resemble mother-o'-pearl; and the other, that of employing in the embroideries of gold and silver thread, thread of horse-hair and whale-bone.—*Ibid.*

A Dial, or Watch, for indicating the precise time of Observations. By Monsieur JACOB.

THE watch of Monsieur Jacob is composed, according to custom, of five wheels and a cylindrical escapement. It performs 18,000 vibrations in an hour; that is to say, five every second. The hand then makes five little leaps in each space between the divisions of the dial. The stay of the hand can act upon one only of these leaps, which limits the inaccuracy in the movement to less than a fifth of a second, a precision amply sufficient for the required purpose. When the machinery is to be set in motion, this is effected by pressing a button similar to that used in repeaters, the action of which may be stopped at pleasure, according to the will of the person making the observation. The arrested hand is then examined, and the second, with its fraction of stoppage, is noted: this fraction is obviously the place at which the stoppage was made, in dividing the whole space between the two divisions into five parts, noting at the same time, that this limb should be centred and divided with great care, to prevent inaccuracy.

The observation being noted, to proceed to another, the pin is pressed with the finger to set the second hand in motion, and in an instant it is observed to hasten to regain its place. The inventor, the better to show the truth of this movement, has furnished another hand, which is not stopped with the former, in order that it may be perceived that this has in fact resumed its place and overtaken the other. This part of the mechanism consists in connecting with the small middle wheel a pinion of the same number as that of the seconds wheel, and in carrying the other moving hand upon the extension of the axis of this pinion, the centre of another seconds dial.—*Bull. de la Société d'encouragement.*

Machine for Dressing Cloth. By Monsieur Beauduin Kamenne.

The object of this machine is to obtain a greater degree of celerity in the napping of cloths, added to a greater perfection in the same operation, than that accomplished by any other mechanism. Although it is constructed upon the same principle as the machines already well known, it nevertheless varies from them in an essential degree, inasmuch as the teazels with which the cylinders are supplied, seize the cloth with double effect, and, consequently, give at the same moment two strokes for one.

In another particular also, not less important, it differs from the machines already in use, and that is, that it dispenses with the necessity of the workman's removing the teazles for the purpose of cleaning them; since that operation is effected spontaneously and incessantly, as the work itself proceeds, and without loss of time, by means of a second cylinder furnished with brushes, and revolving with great rapidity.

The advantages which this machine presents over those now in use, consist, first, in the cost of labour being diminished, and the produce being double that of the common machines: whence it results that half the time requisite for completing this department in the preparation of cloth, is economised. Second, in the economy of expense and time bestowed in cleaning, which was heretofore entrusted to children; moreover, in husbanding the teazles, whereby their duration is extended. Third, finally, in the force consumed, being much less than that of two common frames; the whole, at the same time, occupying the space of one frame only.—*Descript. des Brevets.*

On the Strength and Best Forms of Cast Iron Beams.

[Continued from p. 208.]

These experiments show very clearly that as the elasticity of the material is impaired by the weights applied to it, the deflections by extension and compression become unequal. We are thus prepared to discuss the question whether the force required to destroy the elasticity of cast iron by tension, is equal to that which is required to effect the same result by compression.

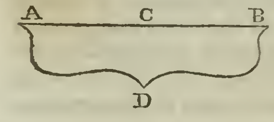
That a greater force is required to destroy the elasticity of cast iron by compression than by tension is shown by the following experiments.

"23. I took two castings, apparently precisely alike, whose dimensions in the section were the same as in the last experiment, (expt. 4,*) and placing the ends of each of them upon two props, four feet three inches asunder, broke them by weights in the middle, one with the broad part downwards thus (⊥), and the other with it upwards, (T).

The first bore 8¾ cwt. and broke with 9 cwt.

Deflection in the middle with 4 cwt. .6 inch.
" " " 8¼ " 1.8 "

"The weights were laid on very gently, and the casting showed no signs of approaching rupture, except a small increased deflection; but when it broke, a piece flew out whole from the compressed side, of the form below, where AB = 4 inches, and CD = .98 inches, the point D at the bottom being in or near to the neutral line. AB was in the direction of the length of the casting, and the weights were laid on at C. Hence since the depth of the casting was 1.35 (expt. 4,) CD $= \frac{.98}{1.35}$ depth $= \frac{5}{7}$ of it nearly.



"This experiment is interesting; it shows the situation of the neutral line, and may, from the peculiar form of the wedge, throw some additional light on the nature of the strain.

"The other casting bore 2¼ cwt. and broke with 2½ cwt.

"The strength of the castings was, therefore, as 8¾ to 2¼, or as 4 to 1 nearly, according as they were broken, one or the other way upwards.

"Those who suppose the strength to be bounded by the elasticity, and that the same force would destroy the elastic power, whether it tended to extend or compress the body, must have conceived these castings, and indeed those of every other form, to be equally strong, which ever way upwards they were turned. A conclusion which we see would lead to very erroneous results, if applied to measure the ultimate strength of cast iron."

At this stage of Mr. Hodgkinson's progress, he was rescued from the necessity of proceeding upon a small scale in his experiments, by the liberality of Messrs. Fairbairn and Lillie, who undertook to have the experiments made at their own expense, the castings being furnished from their own foundry.

"26. I felt desirous of making, on malleable iron, experiments similar to those already given on cast iron, and for this purpose a bar about six feet long was made. It was of the same form as those used in cast iron, its section being uniform throughout, and in the shape of a T, of which the top was five inches broad, and three-eighths of an inch thick, and the vertical part, or leg, one and one-eighth inch deep, and nearly one-fourth inch thick. In the experiments, one end was fixed horizontally and firmly wedged into an immoveable object, a large stack of pig iron, and weights were hung at three feet distance, where the deflections were taken. The experiments were made nearly in the same manner as those on cast iron; only here, we did not subject the same part to both tension and compression, but contiguous parts. Thus, suppose the first experiment was to extend the vertical rib, the next experiment would be to compress it in a part very near to the former place; the piece having been taken out of its fastenings, rendered straight if necessary, and fastened again, the other side upwards, by the part which was most strained before. This mode was used, turning and shifting the piece, throughout its whole length; and toward the conclusion of the experiments, the weights were increased till the vertical rib exhibited signs of being drawn out and crushed.

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* Page 207.

"27. The results from these experiments were anomalous, partly through defective fixing;* but they left no doubt that the extensions, and compressions, were nearly equal from the same forces, and that through their whole range: and therefore that forces not very unequal would have destroyed the piece, whether the rib was drawn out or crushed; a result very different from that which was obtained in cast iron.

"The mean results from the extensions and compressions, with the three greatest weights laid on, were as below—

Weights.	Deflections from extension.	Deflections from compression.
585	1.40	1.54
697	2.00	2.56
809	4.75	4.79"

To strengthen the inference from these results, our author quotes the experiments of M. Duleau upon the same subject. As the method pursued is ingenious, the subjoined translation of the quotation may be acceptable. (Essai Théorique et Expérimental sur la résistance du fer forgé.)

"A bar of wrought iron of square section, $\frac{4}{5}$ of an inch on a side, was bent, when cold, into the arc of a circle, two of its faces remaining plane. Upon these two faces lines had been drawn perpendicular to the axis of the bar, and one inch apart. The bar was bent in three different experiments in different degrees: in the first, for a length of arc of one foot the deflection was $\frac{7}{8}$ths of an inch, in the second $1\frac{1}{2}$ inch, and in the third $2\frac{3}{8}$ of an inch. The lines drawn upon the plane faces remained straight, and the increase of length of the convex side was just equal to the diminution in length of the concave."

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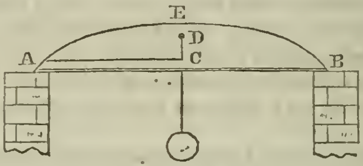
* This objection did not exist in the experiments on cast iron, for in those the castings were rendered utterly immoveable, by means of powerful screws.

We follow the author into the second part of his inquiry; that having reference to the influence of form upon the strength of cast iron beams.

"29. The intention of the preceding experiments, on the elasticities of cast and wrought iron, being to prepare in some degree the way to an inquiry into the best form of beams of those metals, particularly of cast iron, we will now reconsider the strain which beams are subjected to, with a view to their proper formation to obtain the utmost strength. If, then, we conceive a beam, supported at its ends, and bent by a weight any where laid upon it, we have seen that all the bottom fibres, or parts, must be in a state of tension, and the top ones in a compressed state, and if C and D be the centres of tension and compression,* the forces in C will be just equal to those in D, where D may be considered as the fulcrum of the bent lever DCA.

Fig. 3.



"In order to increase the arm CD of the lever, and consequently the strength of the beam, the parts should be disposed as far asunder as possible.† This would perhaps be best effected by putting two strong ribs, one at top, the other at bottom, the intermediate part between the ribs being a thin sheet of metal to keep the ribs always at the same distance, and thereby to prevent derangement from irregular strains, as well as to serve another purpose, which will be mentioned further on.

"30. As to the comparative strength of these ribs, that appears to me to depend upon the nature of the material, and can only be derived from experiment. Thus, suppose it was found that it required the same force to destroy the elasticity of a piece of metal, whether the force acted by tension or compression. In this case, the top rib ought to be equal to the bottom one, supposing it was never intended to strain the beam so as to injure its elasticity. And if it were found that the same weight would be required to tear asunder or to crush a piece of metal, according as it acted one way or the other, the beam should have equal ribs to enable it to bear the most without breaking. Now, from the experiments given above, it appears that these qualities are in a great measure possessed by wrought iron; and therefore whether it was intended to strain a beam of it to the extent of its elasticity, or even to the breaking point, there ought to be equal ribs at top and bottom.

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* See our remarks, p. 205.

† Refer again to remarks, p. 205.

"31. If, however, the metal were of such a nature that a force, F, was needed to destroy its elasticity by stretching it, and another force, G, to do the same by compressing it, it is evident that the ribs ought to be to one another as F to G, in order that the beam might bear the most without injury to its elasticity. And if it took unequal weights, F′ and G′, to break the piece by tension and compression, the beam should have ribs, as F′ to G′, to bear the most without fracture.

"Our experiments on cast iron were not well adapted to show what relative forces would be required to destroy the elasticities; but it appears, by the experiments of Mr. Rennie, that it would take many times the force which would draw it asunder, to crush it. The bottom rib must then be several times as large as the top one to resist best an ultimate strain.

"32. This last matter must be considered with some modifications; it would not perhaps be proper to make the size of the ribs just in the ratio of the disruptive to the crushing forces, as the top rib would be so slender that it would be in danger of being broken by accidents.

"33. The thickness, too, of the middle part of the beam, or that between the ribs, is not a matter of choice; independent of the difficulty of casting, it cannot be rendered thin at pleasure, but must have a certain thickness, though in long beams the breaking weight is small, and a very small strength of middle is necessary.

"The neutral line being the boundary between two opposing forces, those of tension and compression, it seems probable that bending the beam would produce a tendency to separation at that place. Moreover, the tensile and compressive forces are, strictly speaking, not parallel; they are deflected from their parallelism by the action of the weight, which not only bends the beam, but tends to cut it across in the direction of the section of fracture; and this last tendency is resisted by all the particles in the section. Thus, in the figure 1,* the force of compression is not in the direction I*o* produced, but in a direction downwards, oblique to that. It is composed of the force in I*o* produced, and that part of the weight W, whose vertical effect is sustained by the lower part of the beam. This compounded force will then tend to separate the compressed part of the beam in the form of a wedge, and this tendency must be resisted by the strength of the part between the ribs, or flanges. We have already given one instance of fracture this way, and there will occur several others in the course of our experiments.

"34. We see then that there are three probable ways in which a beam might break, 1st, by tension, or tearing asunder the extended part; 2nd, by the separation of a wedge, as above; and 3d, by compression, or the crushing of the compressed part. I have not, however, obtained a fracture by this last mode in cast iron."

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* See figure p. 204.

We deem it unnecessary to give the details of an experiment made upon a beam with flanges, in which the sum of the breadths of the upper and lower ribs were constant. Such a figure would be formed by placing a board upon one of its longitudinal edges, and nailing two triangular pieces to the two edges, the base of one triangle being opposed to the vertex of the other. The quantity of matter in every cross section of this beam would be the same. The results were not generally satisfactory, but one of them is worth noticing, namely, that the beams being supported at one end, and weights applied at different distances from the opposite end, fractures very frequently took place at a distance from the supporting shoulder, at the section where the breadth of the upper and lower flanges were just equal, this being, according to Tredgold, the *strongest section* of the beam.

"36. The indecisive character of these experiments, Mr. Ewart was of opinion might arise from their having been made on too small a scale, and he suggested to me the propriety of repeating them on a larger one: which was done, and the results show a degree of uniformity, which forms a striking contrast to the others. The mode, however, of making the experiments was varied; for, as I had met with difficulty in getting sufficiently good castings from the form of model before used, and as Messrs. Fairbairn and Lillie had a very convenient apparatus, a long lever, for trying or breaking beams, I felt rather more desirous of making the future experiments on small beams, since the results would be more useful in that form.

"37. The form we first adopted was one in which the arc AEB, (figure 3,*) was a semiellipse, and the bottom rib a straight line; but the sizes of the ribs at top and bottom were in various proportions; the ribs in the model were first made equal, and when a casting had been taken from it, a small portion was taken from the top rib and attached to the edge of the bottom one, so as to make the ribs as one to two; and when another casting had been obtained, a portion more was taken from the top, and attached to the bottom as before, and a casting made from it, the ribs being then as one to four.

"In these alterations the only change was in the ratio of the ribs, the depth and every other dimension in the model remaining the same.

"38. In most of the experiments the beams were intended to be broken by a weight at their middle, and, therefore, the form of the arc AEB was of less importance; in making them elliptical they were too strong near the ends for a load uniformly laid over them; the proper form is something between the ellipse and parabola. It is shown, by most of the writers on the strength of materials, that if the beam be of equal thickness throughout its depth, the curve should be an ellipse to enable it to support, with equal strength in every part, a uniform load; and if there be nothing but the rims, or the intermediate part be taken away, it is shown by Hutton in his Treatise on Bridges, or in my Paper, Manchester Trans. 1831, page 364, that the curve of equilibrium, for a weight uniformly laid over it, is a parabola: when therefore the middle part is not wholly taken away, the curve is between the ellipse and parabola, and approaches more nearly to the latter, as the middle part is thinner. Mr. Tredgold states the proper form of the curve to be an ellipse.

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* See figure p. 264.

"39. The instrument used in the experiments was a lever, about fifteen feet long, placed horizontally, one end of which turned on a pivot in a wall, and the weights were hung near to the other; the beams being placed between them and the wall. In the first seventeen experiments, the beams were placed at three feet distance from the pivot in the wall, and in the other experiments, at two feet, except otherwise mentioned.

"All the beams in the twenty-two experiments immediately following each other, were exactly five and one-eighth inches deep in the middle, and five feet long, and were supported on props just four feet six inches asunder. The lever was placed at the middle of the beam, and rested on a saddle, which was supported equally by the top of the beam and the bottom rib, and terminated in an arris at its top, where the lever was applied. The deflections were taken in inches and decimal parts, at or near the middle of the beam, as mentioned afterwards. The weights given below are the whole pressure, both from the lever and the weights laid on, when reduced to the point of application on the beam. The dimensions of section in each experiment were obtained from a careful admeasurement of the beam itself at the place of fracture, which was always very near, (usually within half an inch of,) the middle of the beam, the depth of the section being supposed to be that of the middle of the beam, or five and one-eighth inches.

"As the experiments were made at different times, and there might be some variation in the iron, though it was intended always to be the same, a beam of the same length and depth as the others, but of the common form, always from the same model, was cast with each set of castings for the sake of comparison.

"40. The first six beams in the first series were cast *horizontal*, that is, each beam lay flat on its side in the sand; all the rest were cast *erect*, that is, each beam lay in the sand, in the same posture as when it was afterwards loaded, except that the casting was turned upside down when in the sand.

"In all the experiments, the area of the section was obtained with the greatest care; it includes, besides the parts of which the dimensions are given, the area of the small angular portions at the junction of the top and bottom ribs with the vertical part between them.

"41. The principal objects proposed in the experiments were: first to seek, directed by theory, the form of section, in which a cast iron beam would be the strongest, up to the time of fracture, its length and depth being given: next, to obtain, if possible, a general rule for the strength of such a beam then, since the rules given in the commencement of this paper, * only apply, in cast iron, so long as the elasticity is perfect."

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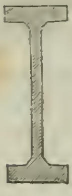
[*] Those deduced by the author from theoretical considerations, sketched at the beginning of our remarks. See notes p. 205.

The nature of our work would render it inexpedient to extract the details of the thirty-six laboured experiments given by the author. We must content ourselves to give specimens of his mode of experimenting, and then present his deductions to the reader.

I. EXPERIMENT.

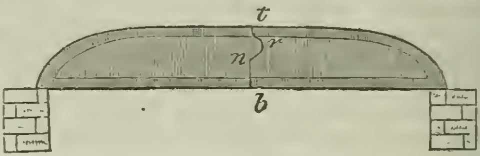
"Beam with equal rib at top and bottom.
Dist. between supports 4 feet 6 inches. Depth of beam $5\frac{1}{8}$ inches.



Dimensions of cross section, at place of fracture, in inches and parts.

Area of top rib $= 1.75 \times .42 = .735$
Area of bottom rib $= 1.77 \times .39 = .690$
Thickness of vertical part between the ribs, $\Big\}$ $= .29$

Area of above section $= 2.82$ inches.
Weight of casting $= 36\frac{1}{4}$ lbs.
Breaking weight 6678 lbs. = 59 cwt. 70 lbs.



"The form of fracture is represented by the line *b n r t*, where *t r* = .6, and *b n* = 2.5, the figure being a side view of the beam.

"To find the strength per inch of cross section, we have, dividing the breaking weight by the area, $\frac{6678}{2.82} = 2368$ lbs. per inch. This quantity in each beam may be taken as an index of its strength, and we shall use it to compare together the strengths of those beams that are of the same length and depth, which is the case in the first twenty-two experiments.

"Comparing this with the result from expt. 4, where the beam bore 2584 lbs. per inch, gives $2584 - 2386 = 216 =$ defect.

"$\therefore$ Loss in strength $= \frac{216}{2584} = .083$ or $\frac{1}{12}$ nearly, in parts of what the common beam bore.

"The form of section above is essentially what Mr. Tredgold has represented to be, that of the strongest beam, while the elasticity is perfect—our future experiments will render it probable that it is in this respect nearly as defective as it is in its ultimate strength."

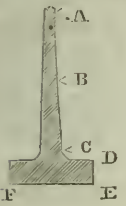
The second experiment was with a beam in which the areas of the section of the top and bottom rib were as one to two. Strength per square inch of section 2567 lbs. In the third the areas of the top and bottom rib were as one to four. The strength 2737 lbs. per square inch.

We subjoin the details of the fourth, fifth, and sixth experiments.

IV. EXPERIMENT.

"Beam cast in common form from Messrs. Fairbairn and Lillie's model.

Distance between supports and depth of beam as before.



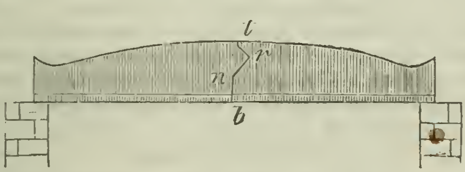
Dimensions of section in inches.

Thickness at A = .32
" " B = .44
" " C = .47
FE = 2.27
DE = .52

Area of section = 3.2 inches.
Weight of casting = $40\frac{1}{2}$ lbs.
Deflection with 5758 lbs. .25 inches.
" " 7138 " .37 "
Breaking weight = 8270 lbs.

"The beam twisted a little before breaking: this, however, was not usually the case in the other beams from the same model.

"Form of fracture as in figure, *tr* = .75.



"Hence strength per inch of section = $\frac{8270}{3.2}$ = 2584 lbs.

V. EXPERIMENT.

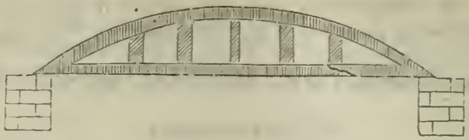
"This casting had its top rib a parabolic arch, and the top and bottom ribs nearly equal in section, with equidistant ordinates only between them.

Distance between supports and depth of beam as before.

Dimensions of ribs in inches.

Area of top rib = 2.2 × .56 = 1.23
Area of bottom rib = 2.2 × .53 = 1.17
Weight of casting = $41\frac{1}{2}$ lbs.
Breaking weight = 5528 lbs. or less: see next exp't.

"This weight, however, is but two-thirds of what was borne by the common beam in the last experiment.



"It broke by separating near the first ordinate, as in the figure, the top part remaining whole; the weight having been removed as soon as the fracture commenced.

"This is represented by Mr. Tredgold, 'Essay on Strength of Cast Iron,' to be a very economical form of beam. It would, there is little doubt, have resisted much more tenaciously if the weights had been laid uniformly over it; but this experiment shows the great weakness of the beam when the weight is applied at a single point, and therefore the danger of using it in practice.

VI. EXPERIMENT.

"A parabolic arch, differing from the last only in its having a portion taken from the top rib and added to the bottom, leaving the height as before, and the ratio of the ribs one to two nearly.

Distance between supports and depth as before.

Dimensions in section of the ribs.

Area of top rib $= 2.2 \times .36 = 0.79$ inches.

Area of bottom rib $= 2.2 \times .75 = 1.65$ "

Weight of casting = 43 lbs.

Breaking weight = 5528 lbs.

"It broke quite off in the same place as the last did.

"Both this casting and the preceding one broke with the first weight laid on them, 5528 lbs., and probably would have done so, particularly the former, with several hundred weight less. The latter casting was doubtless the stronger, as it had more matter in the bottom rib, and they both broke by tension, or by drawing asunder the bottom part: which had indeed been the case with every beam we had tried.

"All the preceding experiments were made on beams cast on their side, from iron, of which the following is a description.

Mixture.

$\frac{1}{3}$ of Blaina, No. 2, } Welsh.
$\frac{1}{3}$ of Blaina, No. 3, }
$\frac{1}{3}$ of W S S, No. 3, Shropshire.

"This mixture is a strong iron, and therefore well suited for beams."

In the seventh experiment a beam cast *erect*, but upside down from the same model as in the fourth experiment, and under a superior head of metal, bore 3188 lbs. per square inch.

Experiment 8th was with a beam modelled as in experiment 3d, but the area of section of the top rib to that of the bottom as 1 to $3\frac{1}{2}$;

strength 2683 lbs. This beam was cast, by mistake, with the broad rib lowest.

Experiment 9th. In this was used the model of the last experiment with one inch in breadth added to the bottom rib. Ratio of the areas of top and bottom rib as 1 to 4½ nearly. Strength 3183 lbs. Gain in strength over beam of experiment 10, nearly one-seventh.

"*Remark.*—Though this beam had a larger bottom rib, it still broke by tension, or by tearing asunder the bottom part first, as was evident since it had neither been crushed nor broke by a wedge, (Art. 34;) this I had noticed to be the case in every experiment, (see expt. 6.) There had been one-seventh gained in strength, above that of the common beam,* by the addition already made, and it was probable, we might add still more to the lower rib without danger of fracture by compression; for in no case, except of the common beam, which sometimes twisted a little before it broke, had there been the slightest appearance of over compression. This idea will be pursued in our future experiments."

"Experiment 10. Common beam cast upside down, in the usual manner. This, like the rest, was from the same model as that in experiment 4." Strength 2792 lbs.

"In the following experiments, the bottom rib is considerably increased, agreeably to the remarks made on experiment 9, but for fear lest the top rib should be overpowered, and by its compression the point of support thrown lower down the beam, and consequently the beam weakened, the top rib was a little strengthened likewise.

"The bottom rib will continue to be increased by small degrees, till such time as the beam breaks by compression, or by the separation of a wedge; at which point perhaps, we shall have arrived at nearly the strongest form of section, for the same depth of beam and quantity of section."

[TO BE CONTINUED.]

On the Friction and Resistance of Fluids. By GEORGE RENNIE, Esq. V. P. R. S.

Read before the Royal Society, June, 1831.

WHEN on a former occasion I communicated the results of a series of experiments on the friction and resistance of the surfaces of solids, (Philosophical Transactions for 1828,) I stated that they formed part only of a series of experiments on the nature of friction generally. My object at first was to trace the relation subsisting between the retardation produced by the surfaces of solids in motion when in contact with each other and with fluids; but finding that the subject connected with either of these branches was sufficiently extensive, I deemed it necessary to postpone the second part of the inquiry to a future occasion. Those experiments, however, established some important facts. They showed that (within the limits of abrasion,) friction was the same for all solids, and that it was neither affected by surface nor velocity. Subsequent experiments upon rolling bodies of great weight and magnitude, when the resistance was reduced one-thousandth part of the mass, and the surfaces in the ratio of thirteen to one, have corroborated the affinity of resistance between rolling and sliding bodies. Thus in connecting and continuing the isolated experiments of Coulomb and Vince, and assigning values to the abrasive resistances of most of the most useful solids, a considerable advance has been made in the science.

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* See experiment 10 which follows.

The subject of the present paper, however, involves difficulties of a more complicated kind. The theory of solids as deduced from the laws of mechanics, and independent of experiment, may be applied to any system of bodies; but the theory of fluids, in which the form and the disposition of the particles, or the laws of their action, are unknown, must necessarily be founded on experiment; and even with this aid, which can only be obtained through the intervention of a solid, our knowledge of the true properties of fluids must be vague and uncertain. Accordingly we find that the subject of fluids attracted the attention of some of the most distinguished mathematicians and philosophers of Europe for the last two centuries; that is, from the year 1628, when Castelli first published his treatise on the measure of running water, down to the hydraulic investigations of Eytelwein and Young. Between these periods, Italy, France, Germany and England, added their contributions to the science. But it is to the Italians principally that we owe the foundation of it, in their numerous investigations and controversies on the rivers of Italy; hence the writings of Castelli, Viviani, Zendrini, Manfredi, Polini, Frisi, Gulielmini, Lechi, Michellotti, and of many others.

Each of them has endeavoured to establish a theory applicable to rivers and torrents, but in general with indifferent success. The science again received fresh accessions from the more valuable investigations of Bossut, Dubuat, Venturi, Funck, Brunning, Bidone, Coulomb, Prony, Eytelwein and Girard; and among our own countrymen, of M'Claurin, Vince, Matthew Young, Dr. Jurin, Professor Robinson, and the late Dr. Thomas Young. Sir Isaac Newton had already demonstrated, in his celebrated propositions, 51, 52, and 53, of the Principia, (in the case of a cylinder in motion immersed in a fluid,) that the resistance arising from the want of a perfect lubricity in fluids is (cæteris paribus,) proportional to the velocity with which the parts of a fluid separated from each other; and that, if a solid cylinder of infinite length revolves with a uniform motion round a fixed axis, in a uniform and infinite fluid, the periodical times of the parts of the fluid thus put in motion will be proportional to their distances from the axis. This theory (although conformable to experiment,) was objected to by Bernoulli and D'Alembert, on the ground that Sir Isaac Newton had not taken into consideration the centrifugal force or friction arising from the pressure of the concentric rings or filaments round the cylinder, the fluid being supposed in a state of permanence, and the friction of the rings equal throughout.

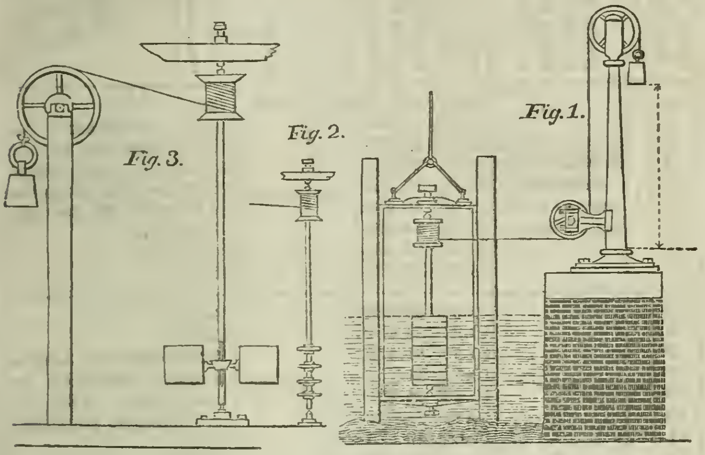
Pitot (1728,) in his experiments on the water works at Marly and Versailles, was the first to demonstrate with equal velocities, and in the ratio of the volume of water, the friction of water in pipes was in the inverse ratio of their diameters; and Couplet, (1733,) Mariotte, and Deparcieux, estimated the difference between the real and calculated expenditures of glass tubes and pipes.

Chezy (in 1771 and 1786,) was the first engineer who endeavoured to establish the relation subsisting between the inclination of an aqueduct and the transverse section of the volume of water it ought to carry—on the supposition that the accelerating force, due to the inclination of the bed of the conduit, is counterbalanced by the resistances of the channel in the ratio of the surface, and increasing in proportion to the square of the velocity. What Chezy had remarked was concluded by Bossut, who cleared the investigation of most of its difficulties, and demonstrated it to be in accordance with theory. He found that small orifices discharged less water in proportion than great ones on account of friction; that the vena contracta, and consequent expénditure, diminished with the height of the reservoir; he pointed out the law by which the discharge diminishes according to the inclination and number of bends in a pipe, and the influence of friction in retarding the velocity of waters moving in canals and pipes, in which he made the square of the velocity to be in the inverse ratio of the length of the pipe; he determined the co-efficients by experiment, and thus obtained a formula expressive of the conditions of the uniform motion of water in open canals. The greater part of these hypotheses may be said to have been removed by the more extensive researches of Dubuat. His great hydraulic work, published in 1779 and 1786, contains a series of the most valuable observations, whose results accord very nearly with the new formula of the motion of water in pipes and open conduits; and his experiments, with pipes inclined in various angles from the 40,000th part of a right angle to 90 degrees, and in channels which varied from a line and a half in diameter to areas of seven or eight square toises, seem to comprehend every case of inclination; so that by collecting a prodigious number of facts, both with compressible and incompressible fluids, he obtained a general expression for all cases relative to the friction and cohesion of fluids: but a logarithmic function which he introduces in it, by a sort of approximation, gives it a character of uncertainty, which restrains its use, and shows the necessity of fresh researches. Ventruri, in 1798, "Sur la Communication latérale du Mouvemens dans les Fluides," repeated and added many new facts to the experiments of Bossut, on the expenditure of differently shaped orifices and tubes, but particularly on the lateral communication of motion by the cohesion of fluids. Coulomb first approximated to the solution of the question, by a very ingenious apparatus, consisting of discs of different sizes, fixed by their centres to the lower extremity of a brass wire, and made to oscillate in fluids by the force of torsion only: he concluded that the resistance was a function, composed of two terms, one proportional to the first, the other to the second powers of the resistance: again, that it was not sensibly increased by increasing the height of the fluid, but simply by the cohesion of the particles of the fluid which presented greater or less resistance, in proportion to the viscidity of the fluid, oil being tò water in the ratio of 17.5 to 1. But whatever might be the conclusions of Coulomb, it is obvious that both the size and construction of his apparatus were ill calculated to produce results whereon to found a satisfactory theory; and accordingly both Messrs. Prony and Girard, in expressing their formulæ of resistance, have not admitted that of Coulomb, but have adopted the mean of the best of experiments made by other authors: but as these formulæ give only the mean velocity, which is much greater than the velocity (of the fluid contiguous to the pipe,) which ought alone to enter into the expression of the retarding force, it follows that the co-efficients deduced from the mean of all the experiments adopted by these gentlemen, have a value greatly inferior to the motion of the fluid contiguous to the side of the pipe or conduit. To ascertain correctly the value of this kind of resistance, M. Girard, (vide les Mémoires des Scavans etrangers for 1815,) undertook a prodigious number of experiments on tubes of different diameters and length, from which he deduced that the retardation is as the velocity simply. The effects of temperature are very remarkable: if the velocity be expressed by 10, when the temperature is 0° centrigrade thermometer, the velocity will be 42°, or increased four times when the temperature is 85°: these values must be deemed approximations only.

The contributions of British philosophers towards the improvement of this science have been, unfortunately, scanty; for, with the exception of Sir Isaac Newton, (who led the way,) Dr. Jurin, Dr. Matthew Young, Dr. Desaguliers, Dr. Vince, Mr. Smeaton, Mr. Banks, and the late Dr. Thomas Young, (see the paper of the latter gentleman in the Philosophical Transactions, and his commentaries on Eytelwein's experiments,) we can scarcely find any experiments on the subject; whatever has been effected by our engineers or scientific men, has either been withheld from the public, or consigned to obscurity; and though we have tracts of marshes and fen land, consisting of many thousand acres, the dissertations on the mode of draining and carrying off their superfluous waters are confined to local pamphlets and reports, of comparatively minor interest to the science of hydraulics.

From the foregoing short but imperfect history, it is obvious that much has been done towards perfecting this science. It is however certain, that much yet remains to be accomplished; and although we are deeply indebted to both the French and English philosophers for their extensive investigations on the laws of capillary attraction, the descents of globes in fluids, and the adhesion of fluids to metal discs, the phenomena of fluidity, and the laws which govern the motion and equilibrium of their particles, must yet remain a problem purely geometrical; and as we possess no tangible means of approximating to the solution of the problem, but through the intervention of a solid, we must content ourselves, in like manner, with the imperfect formulæ deduced from experiments made on a small scale on the friction and adhesion of water in pipes and conduits, until we can ascertain more correctly the causes of the retardations of rivers as they occur in nature.

In the consideration of this question, I propose to examine, first, the retardations of the surfaces of solids moving in fluids at rest; secondly, the retardations of fluids over solids; and, thirdly, the direct resistance of solids revolving in fluids at rest.



To illustrate the first case, I caused an apparatus to be constructed, of which Fig. 1 in the annexed drawing is a representation; it consists of a cylinder of wood ten inches and three-quarters in diameter, and twenty-four inches long, and divided into eight sections of three inches in each, and fixed upon a spindle of iron about four feet in length, and one inch and a quarter thick. The apparatus was accurately turned and polished. Upon the upper part of the spindle, a small cylinder, or pulley, six inches in diameter was fixed, and a fine flexible silken cord, communicating with the weight, was wound; the apparatus was then fixed in an iron frame, and the frame let into a groove in two upright posts, driven into the bed of the river Thames.

The object of the frame was to allow the cylinder to slide up and down with the level of the tide, and immerse it more or less according to the experiment required to be tried. The friction of the apparatus, or the time that the weight took to descend in the atmosphere was first noticed; after which it was successively immersed in the water three, six, nine, twelve, fifteen, eighteen, twenty-one, and twenty-four inches, the difference of time showing the retardation according to the annexed table.

Experiments on the friction of the surface of a cylinder, twenty-four inches long and ten inches three-quarters diameter, moving in air and in water.

TABLE I.

On Surfaces in Water.

Depth of immersion of cylinder.	Wt. suspended.	No. of revolutions of cylinder falling the whole height of 26 feet.	Time in descending in water.	Velocity of periphery per secd. in water.	Time in descending in air.	Velocity of periphery per secd. in air.	Difference between air & water.	Remarks.
In.	lb		scds.	inches.	scds.	inches.	scds.	
3	1	Sixteen turns in descending. Periphery moves thro' 540.32 inches.	15.00	36.021	10	54.032	5.00	Resistance increased by surface with slow velocities, but not in the ratio of the surfaces.
6			18.00	30.017			8.00	
9			25.00	21.612			15.00	
12			28.00	19.267			18.00	
15			32.00	16.885			22.00	
18			37.00	14.603			27.00	
21			40.00	13.508			30.00	
24			55.00	9.824			45.00	
3	2	Ditto.	9.00	60.035	5	108.064	4.00	Resistance scarcely influenced by surface with increased velocities.
6			10.00	54.032			5.00	
9			10.50	51.459			5.50	
12			10.50	51.459			5.50	
15			10.50	51.459			5.50	
18			10.50	51.459			5.50	
21			11.00	49.120			6.00	
24			11.00	49.120			6.00	
On Velocities in water.								
in.	lb.		scds.	inches.	scds.	inches.	scds.	
24	4	Ditto.	8.0	67.54	2.45	196.48	5.15	Could not be tried.
24	8		6.0	90.053	2.00	270.16	4.00	
24	16		4.0	135.08	1.50	360.21	2.50	
24	32		2.5	216.128				

Conclusions.

1. That the friction or adhesion of water against the surfaces of solids in motion, approximates the ratio of the surfaces with slow velocities; but that an increase of surface does not materially affect it with increased velocities.

2. That with equal surfaces the velocities do not seem to observe any fixed ratio, but approximate to the squares of the resistance.

With increased velocities the index of the power was found to be less than the duplicate ratio.

To exemplify the result of the foregoing conclusions in a different way,—the cylinder was removed, and circular discs of iron, ten inches and three-quarters diameter, and one-eighth of an inch thick, accurately adjusted to the spindle, and polished, were substituted, as Fig. 2. The friction of the apparatus was again tried, and immersed in the river Thames as before.

TABLE II.

Experiments on the friction in water of circular discs ten inches and three-quarters in diameter and one-eighth of an inch thick, revolving with the planes parallel to the horizon, and six inches apart.

No. of discs.	Wt. suspended.	Height fallen of weight.	Time of wt. descending in water.	Velocity of periphery per second.	Time descending in air.	Velocity of periphery per second in air.	Difference.
	lbs.	Twenty-five feet, mean circle 16.88 would move through 422 inches.	scds.	inches.	scds.	inches.	scds.
1	1		10.00	42.200	2	211	8.00
	2		5.00	84.400			3.00
	3		3.00	140.660			1.00
	4		3.00	140.660			1.00
	6		3.00	140.660			1.00
2	1	Ditto.	15.00	28.133	2	211	13.00
	2		6.50	64.923			4.50
	3		4.50	93.770			2.50
	4		4.00	105.500			2.00
	6		4.00	105.500			200
3	1	Ditto.	17.00	24.823	2	211	15.00
	2		7.00	60.285			5.00
	3		5.50	76.727			3.50
	4		4.00	105.500			2.00
	6		3.00	140.660			1.00
4	1	Ditto.	33.00	12.787	2	211	31.00
	2		17.00	24.823			15.00
	3		8.00	52.750			6.00
	4		6.00	64.923			4.00
	6		4.00	105.500			2.00

Conclusions.

That the friction or adhesion of water is not quite as the surfaces with slow velocities, being in the ratio of one to three instead of one to four, but diminishes rapidly; without observing any ratio in increased velocities.[*] Hence, the resistance of a ship or vessel moving through the water, with an average or higher rate of velocity, forms an inconsiderable portion of the resistance resulting from the displacement of the fluid, and that the brightness observed on the copper of ships after a voyage, may be owing to other causes than the friction of the water simply.

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[*] The experiments of the Society for the improvement of Naval Architecture show a decreased resistance with increased velocities.

An experiment was made to ascertain the comparative resistance of a pipe revolving in water, and with water running through a pipe; when the resistance was found to be as the surfaces in slow velocities, but to diminish greatly, as before in high velocities, without observing any fixed ratio.

The above conclusions are in contradiction of those of Coulomb, who did not find that pressure augmented the resistance, but states that the resistance is greater when the immersion is partial.

This apparatus being applicable to fluids generally, advantage was taken of it to ascertain the direct resistance of solids to fluids,* by causing plates and globes to revolve in them, with their planes perpendicular to the plane of the horizon, (see Fig. 3.)

As the resistance of solids in fluids does not form the object of this paper, it will be necessary to introduce many detailed observations on the subject of these experiments at present, connected as they are with another branch of hydrodynamics. But as it is important to show the relation subsisting between the resistances of cohesion and impulse, I have ventured to detail the following experiments.

TABLE III.

Experiments on the rotations of iron discs and wooden balls moving in air, with their planes perpendicular to the plane of the horizon.

Wt. suspended.	Height fallen.	Time in descending.					
		Two circular discs 10¾ inches diameter. Area 81 in.	Velocity per second.	Two square fans. Area 81 inches.	Velocity per second.	Two wooden balls 10¾ in. diameter.	Velocity per second.
lbs.	The spindle made 15.9 turns in falling 25 feet. Mean circle 51.83 would move through 6 8.67 feet.	scds.	feet.	scds.	feet.	scds.	feet.
2		10.00	6.867	10.00	6.867	23	2.984
4		6.00	11.445	7.00	9.810	13	5.282
9		4.50	15.261	4.50	15.261	8	8.584
16		3.00	22.891	3.25	21.130	7	9.810
20		2.50	27.469	3.00	22.891	6	11.445

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* In this case, the number of particles struck will be diminished in the ratio of the radius to the sine of inclination; wherefore the resistance will be diminished in a duplicate ratio of the radius to the sine of inclination. But as the sines of inclination of the two plates are equal, the resistances will be equivalent to the area of one plate (moving perpendicularly to its plane) into the duplicate ratio of the velocity of its motion, and the density of the fluid.

Conclusions.

1. That the resistances are as the squares of the velocity.
2. That the comparative resistances between discs and globes are as two to one nearly.

TABLE IV.

Experiments on the resistance of iron discs and wooden globes revolving in water.

Weight.	Height fallen.	Time in descending.					
		Two circular discs 81 inches area.	Velocity per second.	Two square fans, 9 in. square, 81 in. area each.	Velocity per second.	Two wooden balls. Area 81 inches.	Velocity per second.
lbs.	The spindle made 15.9 turns in falling 25 feet. Mean circle 51.83 would move through 824.19 inches, or 68.67 feet.	scds.	feet.	scds.	feet.	scds.	feet.
16		63	1.09	53	1.29	15.00	4.57
20		54	1.27	48	1.43	14.00	4.90
32		43	1.59	40	1.71	10.50	6.59
40		40	1.71	35	1.96	9.50	7.22
64		30	2.28	28	2.45	8.00	8.58
256		14	4.90	15	4.57	5.00	13.73

Conclusions.

1. That the resistances are the square of the velocity.
2. That the mean resistances of circular discs, square plates, and globes in air, are as the numbers 25.180, 22.010, 10.627; and in water, 1.18, 1.36, 0.755; consequently the proportional resistances of air to water, with

Circular discs, is as	1 to	21.3
Plates and fans,	1 to	16.2
Wooden balls,	1 to	2.2

Note.—A portion of the square fans, represented in Fig. 3, and equal to one-fourth of the area of each fan, was cut off, when the resistance was found to be the same as with the square fans.

Experiments on the quantities of water discharged by orifices and tubes of different diameters and lengths, and at different altitudes.

The phenomena incident to spouting fluids are,

First, The inequality observed in the velocity of the particles comprised in every horizontal section parallel to the orifice.

Secondly, The contraction of the fluid vein beyond the orifice, and consequent diminution of discharge as compared with theory.

Thirdly, The inversion and changes in the sections of the fluid vein at different distances from the orifices.

All these phenomena have been noticed and recorded by various writers, and formulæ adapted to the different circumstances of the expenditure have been given. But neither Bossut or Du Buat, (the most accurate of writers,) have recorded a continuous and systematic series of experiments upon the comparative expenditure of orifices and tubes under the circumstances of area, altitude, and length.

The apparatus with which these experiments were performed, consisted of a wooden cistern very accurately made, two feet square inside, and four feet four inches in height. The water was kept at a constant altitude by a regulating cock; and a float, having an index attached to it, enabled the observer to ascertain the exact height at which the water stood in the cistern above the centre of the orifice.

The orifices were accurately made by Dollond in brass plates one-sixtieth of an inch in thickness. The plates were accurately adjusted to a hole in the side of the cistern, and closed by a valve of brass ground to each of the plates. The valve was opened by a lever, and the time noted by chronometers.

The diameters of the tubes, from having been drawn on mandrils, were as accurate as possible; their diameters at the extremities were carefully enlarged, to prevent any wire edges from diminishing their sections; and one extremity of the tube being inserted into a block of hard wood fastened to the cistern, and the other stopped by a valve, the experiments were recorded as before.

Circular orifice made in a brass plate 1 in. diameter, $\frac{1}{60}$ in. thick.

Constant height of the surface of the water above the centre of orifice.	Real time in discharging one cubic foot.	Theoretical time in discharging one cubic foot. $t = \frac{Q}{2A\sqrt{gH}}$.	Ratio of the theoretical to the real discharges.	Vena contracta.
feet.	scds.	seconds.		
4	19.50	11.4	1 ; .584	Not accurately measured.
3	21	13.2	1 ; .628	
2	26	16.1	1 ; .619	
1	36	22.8	1 ; .633	
Circular orifice in a brass plate ¾ in. diameter, $\frac{1}{60}$ in. thick.				
4	33	20.3	1 ; .614	At six-tenths of an inch from the orifice, the diameter had contracted to 0.685 of an inch.
3	37	23.4	1 ; .632	
2	44	28.7	1 ; .652	
1	63	40.6	1 ; .644	
Circular orifice in a brass plate ½ in. diameter, $\frac{1}{60}$ in. thick.				
4	73	45.7	1 ; .626	At half an inch beyond the orifice, the diameter contracted to 0.37 of an inch.
3	83	52.8	1 ; .633	
2	104	64.6	1 ; .621	
1	144	91.4	1 ; .631	
Circular orifice in a brass plate ¼ in. diameter, $\frac{1}{60}$ in thick.				
4	276	182.9	1 ; .662	At ¼ in. beyond the orifice, the diameter contracted to one-twentieth inch less than the orifice.
3	320	211.3	1 ; .660	
2	396	258.6	1 ; .653	
1	545	365.7	1 ; .671	

N. B. Each result shows the mean of four experiments.

Remarks.

The phenomena relative to the form and direction of veins of spouting fluids, and the remarkable inversion of the fluid veins at certain distances from their orifices, have been so fully noticed in "Experiences sur la Forme et sur la Direction des Veins et des Courans d'Eau; par George Bidone; Turin, 1829," that it is unnecessary to state further, than that they have been completely corroborated in the foregoing experiments.

[TO BE CONTINUED.]

On the determination of the thickness of solid Substances, not otherwise measurable, by Magnetic Deviations. By the Rev. WILLIAM SCORESBY, F. R. S.

IN the first part of this paper, the author states the results of a series of experiments undertaken by him with the view of ascertaining whether all bodies are equally and uniformly permeable to the magnetic influence. Out of a great number of substances not ferruginous, but of various qualities, thickness, and solidity, which were subjected to trial, no instance occurred of their offering any perceptible obstruction to the action of a magnet on a compass, when interposed between them. No interruption to this action occurred, even when the intervening bodies were iron ores, of which several were tried, excepting in one or two cases in which the ore was found to be itself magnetic. Hence, the author was led to conceive, that an accurate estimation of the magnetic influence transmitted through solid substances, might afford an excellent mode of ascertaining the thickness of such substances which might not be otherwise determinable.

In order to judge of the degree of accuracy with which this might be accomplished, he instituted various sets of experiments; first, placing the magnet in a line pointing to the centre of the compass, and on a level with it, in the east and west magnetic direction; and secondly, in positions more or less oblique to this direction. He found reason to conclude from these trials, that the degree of accuracy attainable by this method was such as to render it highly advantageous in mining operations. Thus the thickness of a mass of freestone rock on the Liverpool and Manchester rail-way, three feet two inches in thickness, was determined by this method to within the eighth of an inch of its actual measurement, exhibiting an error of only one 334th part of the whole.

Many experiments were made to determine the effect which the form, dimensions, quality, and number of magnets have on the extent of their directive influence on the compass. It was found that little, if any augmentation of power results from increasing the thickness of the magnet; but that, with magnets of similar form, the directive forces are nearly in the direct ratio of their lengths. The author gives the results of an extensive series of experiments on the combined influence of several magnets, arranged, either in contact or in juxtaposition, in a great variety of ways. The contact of dissimilar poles was in all cases productive of an increase, and that of similar poles of a diminution of efficiency.

In the second part of this paper the author enters into an investigation of the law of the magnetic directive power, with reference to distance; in which he finds it convenient to estimate all distances in multiples of the length of the magnet employed, or, more correctly, of the interval between its two poles. From the established law of magnetic force, namely, that it is in the inverse duplicate ratio of the distance, the author deduces formula for estimating the directive power of a magnet on a compass at different distances. The combined action of four magnets, on a compass of Captain Kater's construction, which was five inches in diameter, will afford a tolerably accurate measurement of the thickness of any solid intervening substance, when about forty feet thick; but even at the distance of eighty-two feet the deviation produced by the magnet will be two minutes of a degree, and therefore still very appreciable. But the sensibility of the compass to the magnetic influence might be much further increased, by the application of a small directing magnet, placed in such a situation as to neutralize the greater part of the directive influence of the earth. By this means the author obtained a deviation in the compass of about 5′, at a distance of 61 feet, which extended through a variety of solid materials, including soil, stones, and brickwork.

In the third part of this paper the author treats of the practical application of the magnetical influence in engineering, in tunneling, and in mining, for determining the thickness of solid masses in different situations where circumstances preclude the possibility of direct measurement. He adduces a variety of instances in which the information thus obtained would prove of the greatest value, in directing the operations in progress, or determining those to be undertaken, and frequently in preventing the occurrence of accidents which the want of such knowledge may occasion. He concludes with a statement and explanation of various practical directions for the employment of the method recommended.

[*Trans. Royal Society. Phil. Mag.*

Manufacture of Vinegar from Grain. By Monsieur Dubrunfaut.

The grain employed in this manufacture is a mixture of one part malt with four parts rye; ground in the same manner as for brewing or distillation. Rye is preferred to malt, because it more easily turns acid.

In this state the corn is macerated in about six or eight times its weight of water, as in a distilling process. The soaking, fermentation, &c. is all conducted as in the making of alcohol. In fact, the result of this first stage of the operation is to make a wine.

When the fermentation has subsided, which takes place in the course of a few days, the alcoholized mass is divided into two portions, the liquid from the compact residuum; which latter is placed in a vessel to undergo distillation, the draining of this distillation is added to the clear liquid, and passes into a heated chamber to undergo the acetous fermentation.

The heated chamber contains barrels placed upon their sides and on tressels. These barrels are half, or three-fourths, filled with liquid. To set the whole in action one-fourth or one-fifth of their capacity is supplied by vinegar prepared in the ordinary manner, together with the membraneous substance which is formed in the barrels where the vinegar is preserved. This being done, the barrels are filled to the half, or two-thirds, with the above mentioned clear decoction.

The room in which the vessels are placed should be kept at a constant temperature of from 30° to 35° of Réaumur. Every day the liquid is drawn off from each vessel, and poured upon the others. To accomplish this an empty cask is used to receive the contents of the first barrel; this receives the contents of the second, and so on in succession. This operation, by agitating and airing the liquid, favours the production of the vinegar, and it should be repeated many times a day.

By the above process the vinegar is fully developed at the end of a month or six weeks. If the whole operation have been well conducted, the half of the vinegar contained in each vessel is drawn off into small casks, placed in a cool chamber, where the clarifying is performed.

The space produced in each cask by this reduction, is filled by the alcoholized liquid, equal to the volume of vinegar that has been drawn off.

The clarification is effected with beech shavings, which possess an astringent quality. [*Agricult. Manufacturier.*

On the Thermostat or Heat Governor, a self-acting physical apparatus for regulating Temperature. Constructed by Andew Ure, M. D. F. R. S.

The principle of the instrument here described is the unequal expansion of different metals by heat. A bar of zinc, alloyed with four or five per cent. of copper, and one of tin, about an inch in breadth, one quarter of an inch thick, and two feet long, is firmly and closely riveted along its face to the face of a similar bar of steel about one-third in thickness. The product of the rigidity and strength should be nearly the same, so that the texture of each may pretty equally resist the strains of flexure. Twelve such compound bars are united in pairs by a hinge joint at each of their ends; having the zinc or alloy bars fronting one another. At ordinary temperatures these bars will be parallel, and nearly in contact; but when heated, they bend outwards, receding from each other at their middle parts, like two bows tied together at their ends. When a more considerable expansion is wanted, a series of such bars is laid one over the other. The movement thus resulting is applied by the author in various ways to regulate the opening of dampers, letting in either cold air or cold water, or closing the draught of a fire-place, as the case may be. He proposes its employment to regulate the safety valves of steam boilers, as working with more certainty than the common expedients.

[*Trans. Royal Society. Phil. Mag.*

Note by the Editor.—The foregoing appears to be identical with the method of regulating heat for which L. W. Wright obtained a patent in August last. This similarity was referred to in noticing that patent. See pages 130, 131.

Poisoning by the (Sebacic) Acid of Goose Grease.

On the 2nd of April, 1829, Dr. Seidler was called to attend MM. H——, and their children. On his arrival he found the two brothers H——, one aged thirty-one, the second twenty-eight years, and the two children of the first, one a girl æt. four, the other a boy æt. two and a half, all presenting the following symptoms,—cold sweat, anxiety, vertigo, general paleness, and prostration of strength, eyes sunken and pupils dilated; burning pain was felt in the lower part of the belly, increased by pressure; violent vomiting, succeeded by ardent thirst, for which the patients had drunk large quantities of milk, which was thrown up without producing any effect; tongue dry; involuntary discharge of urine and fæces.

The eldest brother was insensible for six minutes; his respiration was scarcely visible, his pulse imperceptible, and the heart's action exceedingly weak. The second brother had vomited blood several times, but he experienced less abdominal pain than the other. In the little boy the globes of the eyes were turned upwards, the lips livid, and the pulse scarcely sensible. Lastly, the symptoms in the little girl were the mildest of all. M. Seidler suspected at once that these accidents were occasioned by the use of a certain quantity of goose grease, which had been employed in the preparation of some meat, of which the four patients had eaten shortly before the symptoms began. An emulsion, containing hyoscyamus, was prescribed, and on the 9th of April all had recovered.

The vomited matters were subjected to chemical analysis: they were strongly acid, but contained no metallic poison: but the following facts induced Dr. Seidler to attribute the illness to the effect of sebacic acid. The lady of the house had made use of goose grease to dress some veal, and all the persons who partook of the dish fell quickly sick. The lady herself, who had barely tasted it, felt it so disagreeable that she took no more. None of the grease which was suspected to have caused the accident, remained for examination, the pot which contained it having been entirely emptied and cleaned out; but on examining the same kind of grease contained in three other pots, it was found to exhale a strong repulsive odour, and it reddened strongly blue paper tinged by turnsole. Three ounces of this grease were given to a vigorous, well-formed dog: an hour after his extremities became violently convulsed; he cried piteously, he refused to eat, his eyes were suffused, pupils dilated, skin cold, and arterial pulsation scarcely perceptible. In this state he continued for thirty hours, after which he slowly recovered. [*Hufeland's Journal.*

Method of Marking Linen.

The necessity of marking the linen of hospitals, &c. in a perfect and durable manner, so as to resist the action of alkalies, soap, &c. is so important as to have induced M. Henry to examine the methods in use, and endeavour to replace them by a better. The sulphate and muriate of manganese, the sulphate and acetate of iron, nitrate of silver, acetate of alumine and iron, and acetate of lead, mixed with gum or indigo, or ink, have been used for the purpose; but all either require previous or subsequent operations of some nicety, as immersion in carbonated alkalies or hydro-sulphurets, or else such degree of care as to be inexpedient in the hands of the women or persons to whom the duty generally devolves.

The following is the process which M. Henry ultimately recommends as the very best. Take one part, by weight, of iron filings, and three parts of vinegar, or acetic acid of s. g. 1056. Mix the filings with half the vinegar, and agitate it continually. As it thickens, add the rest of the vinegar, and also one part of water. Then apply heat to assist the action, and when all the iron is dissolved, add three parts of sulphate of iron, and one part of gum arabic previously dissolved in four parts of water. These are to be mixed well at a gentle heat, and will yield twelve parts of the preparation.

When to be used, the linen is to be spread on a table, and the preparation applied by means of a hair brush, and stencil plates of copper.—*Jour. de Pharm.* 1831, *p.* 388.

New applications of Artificial Ultramarine.

It is well known that a few years since M. Guimet discovered a process of manufacturing ultramarine from its proximate elements, and without the use of lapis lazuli. He has latterly described a great extension of this, his manufacture, in a letter to M. Gay Lussac. A paper manufacturer wished to apply this ultramarine in place of smalt to the colouration of his papers, and was, in consequence, supplied with a sufficient quantity to make a large experiment. The latter paper made had as good a tint as that coloured with smalt, and was more uniform, but it was found that, in producing this effect, the one pound of ultramarine, because of its extreme division and intense colour, was as effectual as ten pounds of the finest smalts. After this, 200 lbs. of ultramarine were sold to the paper makers of Lyons at the price of twenty francs per pound, and proved to be more economical than smalt. In consequence, M. Guimet has very much extended his manufactory, and is able to sell ultramarine for these uses at the price of sixteen francs per pound.

The ultramarine for painters requires a particular purification, as well as careful selection from all that is manufactured. The price for the finest quality is sixty francs the pound. The second quality is twenty francs the pound.

Besides its use in paper making, the manufacturers of calicoes, muslins, &c. &c. are beginning to use it, and M. Guimet expresses a hope, that shortly France will be entirely independent of other countries for the blues required for these uses.

[*Ann. de Chimie*, xlvi. 431.

A machine for drilling Cast Iron, used in the manufactory of Monsieur Calla.

This machine which acts upon the principle of the stock and bit, is simple and solid, being composed entirely of iron. It works with as much regularity as promptitude.

The block to be perforated, being firmly fixed upon a solid plank, the drill is brought down upon it. The operation consists in turning a fly, which plays upon a roller, a cord from which is fastened to the lever which brings down the drill. The moving power being acted upon, the tool turns with considerable rapidity; but as the weight of the apparatus would not be of itself sufficient to urge it forward in proportion to the progress of the drill, the fly is kept constantly turning.

When the hole is perforated the tool is withdrawn by raising the apparatus, which preserves its vertical position, whatever may be the degree of elevation or depression of the lever to which it is suspended. [*Rep. Pat. Inv.*

Resistance opposed to Water moving in Pipes.

Notwithstanding the endeavours made to deduce formula from experiments on the passage of water through tubes, so as to assist and guide the engineer in laying down pipes to supply manufactories or towns, yet frequent mistakes have occurred: thus at Paris, at the *Fountaine des Innocens*, only two-thirds of the water calculated upon were obtained; whilst in the *faubourg St. Victor*, only the half of that expected issued from the pipes. These differences appear to result from experiments made on too small a scale, or with apertures disproportionate to the areas of the tubes; for the results of practice come sufficiently near to the formula of MM. Prony and Eytelwein, when the velocity of motion in a pipe was small in consequence of a contracted aperture made in a plate of metal being used. When the contracting plate was altogether removed, then the product in water was a fourth or third less than that given by the formula; from which M. D'Aubuisson concludes that the resistance increases with the velocity in a greater ratio than that given to it in the calculations; where it is supposed to increase proportionally $a\,v^2 + m\,v$, m being nearly equal to 0.055, and v representing the mean velocity.

In consequence of the arrangement and state of the water pipes at Toulouse, some large and accurate experiments have been made there by MM. Castel and D'Aubuisson, the systems of pipes of 4.7 inches and 10.63 inches in diameter, and 1434 and 1986 feet in length. In these experiments the quantity of water passed and the pressure were varied; the results were noted and also calculated by the formula, so as to deduce the loss of pressure due to the resistance of the pipes; that, by calculation, came out 27., 25., 32.7, and 31.7 per cent. below the result of experiment. As the two latter were the principal experiments, it is concluded that, generally, calculation gives the resistance nearly one-third less than what is obtained by actual and careful practice.—*Ann. de Chimie.*

Machine for Cutting Veneering Wood into thin sheets, and of every length.

This machine, employed in Russia, possesses this peculiarity; that instead of cutting the wood from the flat and thick surface, it carries off from its circumference a continuous shaving; the result of which is, that leaves of an indefinite length are produced, agreeably veined and knotted.

The construction is simple, combining the advantage of cutting the precious woods without waste, and very rapidly, to an extraornary extent, and so thin that they have been employed for the covering of books, and for lithographic and other engraving. One hundred feet in length of veneering may be cut in the space of three minutes.

They begin by placing the timber from which the leaf is to be cut, upon a square axle; when it is revolved and made circular with a turner's gouge. The blade of a plane of highly tempered steel, and rather longer than the cylinder, is fixed at the extremity of a frame six or seven feet in length, in such a manner as to exert a constant pressure upon the cylinder, and pare off a sheet of an equal thickness, which folds upon another cylinder like a roll of linen. The frame to which the blade is attached, is moveable at its lower extremity, and as it is charged, it depresses in proportion as the mass diminishes in substance. That this depression may be progressive and perfectly regular, the inventor has appended a regulator to the machine, consisting of a flat brass plate, preserved in an inclined position, upon which the frame descends as the regulator itself is advanced. The motion is communicated to the cylinder by means of several cog wheels, which are turned by a crank. [*Ib.*

Improvement in the mode of making Paper for Writing, Printing, and Wrapping from Wood.

The wood is reduced to shavings of the ordinary jack-plane shaving size, so as to be rendered nearly of the same size: these are then placed in a cistern or boiler, sufficiently large, and covered with water which is raised to the boiling point of heat. To every one hundred pounds of the wood so reduced, from twelve to eighteen pounds of alkali, either vegetable or mineral, are put, in proportion to its quality for strength. If salts are used, they should be reduced before they are placed on the wood. They may, however, be put in with the water and wood before reduction, but the first method is the most preferable. Should lime be used, there must be a sufficient quantity in all cases to equal twelve pounds of pure black salts. One hundred pounds of wood will, if well attended to, make from five to seven reams of paper. [*New Monthly Mag.*

Meteorological Observations for March, 1832.

Moon.	Days.	Therm.		Barometer.		Dew point	Wind.		Water fallen in rain.	State of the weather, and Remarks.
		Sun rise.	2 P.M.	Sun rise.	2 P.M.		Direction.	Force.		
				Inches	Inches.				Inches.	
⊗	1	26°	42°	30.30	30.30	17	NE. SW.	Moderate.		Clear day.
	2	32	51	.30	.24	34	E. E.	do.		Cloudy—clear.
	3	41	58	29.84	29.84	32	SW. W.	Blustering.		Flying clouds—clear.
	4	28	53	30.00	.95	30	W. SW.	Moderate.		Clear—overcast.
	5	45	52	29.60	.50	48	SE. W.	do.	.44	Rain—cloudy.
	6	36	50	.50	.50	34	W. W.	Blustering.		Flying clouds—cloudy.
	7	31	48	.80	.80	25	W.	do.		Clear day.
	8	28	55	30.10	30.10	30	W. SW.	Moderate.		Clear day.
☽	9	35	60	.10	.00	37	SW. S.	do.		Clear—hazy.
	10	35	63	.00	.10	45	SW.	do.		Fog—cloudy.
	11	39	58	.10	.00	58	S. SE.	do.		Showers—cloudy.
	12	63	67	29.80	29.60	62	SW.	do.	.65	Rain—cloudy—thund. sh.
	13	44	56	.50	.60	44	W.	do.	.15	Clear day—snow and rain
	14	18	26	.70	.80	9	W.	Blustering	.4	Cloudy—flying clouds.
☺	15	18	36	30.20	30.20	10	N. W.	Moderate.		Clear day.
	16	26	50	.20	.20	26	S. SW.	do.		Clear day.
	17	41	42	29.70	29.50	30	NE. W.	Blustering.	.48	Rain—snow and rain.
	18	11	24	.70	.80	1	W.	do.		Cloudy day.
	19	17	31	30.15	30.15	4	W.	Moderate.		Clear day.
	20	31	47	.10	29.95	31	SW. S.	do.		Cloudy day.
	21	40	44	29.55	.55	26	W.	Blustering.		Cloudy—flying clouds.
	22	28	38	.70	.80	12	W.	do.		Clear day.
☾	23	26	54	30.00	.94	26	E. S.	do.		Hazy—clear.
	24	44	68	29.90	.90	41	SW.	Moderate.		Cloudy—hazy.
	25	44	73	.90	.80	50	SW. S.	Blustering.		Fog—clear.
	26	46	44	.70	.70	45	SW.	do	.42	Rain—clear.
	27	36	42	30.20	30.20	29	NW. W.	Moderate.		Clear day.
	28	31	54	.20	.20	27	W. SW.	do.		Cloudy—clear.
	29	34	55	.10	.10	32	W. SW.	do.		Clear day.
	30	39	54	.20	.20	34	SE.	do.		Cloudy—clear.
	31	36	64	.5	29.80	46	SW.	Blustering.		Cloudy—clear.
	Mean	33.84	50.29	29.94	29.91	34.6			2.18	

	Thermometer.	Barometer.
Maximum height during the month,	73. on 25th.	30.30 on 1st.
Minimum do. . .	11. on 18th.	29.50 on 5th, 6th, 13th and 17th.
Mean do. . .	42.07 . .	29.92

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MAY, 1832.

Further remarks on the application of water upon wheels, with reference to a communication under the signature of C. in the last number. *By* James P. Espy.

TO THE COMMITTEE OF PUBLICATION OF THE FRANKLIN INSTITUTE.

Gentlemen,—In the preceding number of this Journal, I find an article signed C., containing, among other things, the following statement. "Mr. Espy arrives at (what I conceive to be) the erroneous conclusion that water let on to a wheel at a less velocity than that of the wheel itself, will give a maximum effect."

I am much obliged to C. for turning my attention to this subject again, particularly as I now believe with C. that my conclusion on this point was an erroneous one.

The question under discussion is, what power is lost at the Fair Mount water works by letting the water on the wheel under a one foot head at an angle of forty-five degrees with the tangent, the wheel moving with a velocity of twelve feet per second?

In the paper which C. criticises I had endeavoured to show that more power was gained by letting the water on the wheel above the point where it would have the velocity of the wheel, than was lost by the retarding effect of inertia, in being suddenly accelerated by the wheel itself.

The calculation was made on the supposition that water, or any other heavy body, produces the same mechanical effect by moving with a uniform velocity downwards the same distance, whatever its velocity may be.

If this supposition is correct, (and perhaps some may still think it is,) my former calculation was right. Perhaps the question can be settled to every body's satisfaction only by experiment. I believe, however, upon mature deliberation, that *time* is the element in this calculation, and not *space.*

For example, the water at Fair Mount comes on the wheel with a velocity six and one half feet slower than the motion of the wheel. Now, if time is the element to be considered, it must lie on the wheel, to balance inertia, as long as a body takes to acquire the velocity of six and a half feet in falling freely through space from the commencement of its motion.

This time is about one-fifth of a second, therefore the water must lie on the wheel one-fifth of a second in order to balance the inertia; but as the wheel moves with a velocity of twelve feet per second, the space will be one-fifth of twelve feet, or nearly twenty-nine inches.

According to this mode of calculation, therefore, the loss of power due to inertia alone is twenty-nine inches, and if to this twelve inches be added, because the water comes on the wheel twelve inches below the surface of the dam, the whole loss of power will be forty-one inches. Whether this mode of calculation will meet the views of C. I do not know, for he does not say definitely what the loss of power is, he only says, it is "more than twenty-seven inches."

From these remarks, C. will perceive that, as he imagined, I have "at once seen the error into which I had inadvertently fallen, and as promptly corrected it."

I cannot, however, agree with C. "that L. M. has erred in supposing that water in motion at a velocity due to one foot head, viz. eight feet per second, at an angle of forty-five degrees to the direction of the wheel, would oppose a resistance to the buckets by the influence of its inertia, proportioned to the difference between the velocity of the wheel and that of the water in the direction of the wheel, viz. six and a half feet." Nor do I think that the "error is obvious from the fact, that the water strikes the soaling of the wheel at an angle of forty-five degrees, by which its motion, instead of being destroyed, is only changed to the direction of the wheel's motion, and that therefore, all which can be lost by this change of direction, is what may be occasioned by the agitation of the water, and, therefore, it moves in the direction of the wheel at a velocity but little less than eight feet per second." For, in the first place, we have no reason for supposing that the water moves faster in the direction of the wheel after it strikes the soaling than before; and, in the second place, we are sure, "from first principles," if it does move faster it is only by reacting on the wheel.

For action and reaction are equal, and in opposite directions. Therefore, if the water spends its force on the soaling of the wheel in changing its direction, if that soaling is parallel to the tangent, its velocity in the direction of the tangent can neither be increased nor diminished.

If we suppose the water and the soaling both perfectly elastic; the water upon striking the soaling would rebound, making the angle of reflection equal to the angle of incidence; and the velocity in the direction of the tangent, would evidently remain the same. If we suppose the water and the soaling both perfectly hard and smooth, upon striking the soaling, the motion of the water in the direction of the radius of the wheel would be entirely destroyed, whilst that in the direction of the tangent would remain the same.

I think it is not necessary to pursue this subject further, especially as I am sure C. will have the candour to acknowledge his mistake provided he should be led to discover it by these remarks.

As to the other point in controversy, perhaps some may think that I have given it up too readily, and may still be inclined to believe that my first method of calculating was founded on true principles, and that it is a universal rule, without an exception, that the mechanical effect of water is to be measured by the distance it descends, and in no instance by the time. I will only observe that the point can be settled to the satisfaction of all by the following simple experiment.

Let the water be admitted to a water wheel at various points from the bottom to as near the surface of the water as possible; if *time* is the true element in the calculation in question, the wheel will move with the greatest velocity when the water is introduced at the bottom of the wheel; and it will move slower and slower as it is introduced higher up; but if the space descended is the true element, the velocity of the wheel will be greatest when the water is introduced under one fourth of the whole head, that is, one fourth being above and three fourths below the point of introduction. As the place of introduction varies from this point, the wheel will move slower, until finally the motion will be slowest of all when it is introduced at the bottom of the wheel, or at the surface of the water, at which points the velocities will be equal.

Perhaps I may be permitted, without being considered as departing altogether from the subject of this communication, to introduce again to the notice of C. an experiment which I mentioned in a former controversy with him,* as proving positively that momentum is proportional to the velocity of a body, and not proportional to the square of the velocity, as he contended.

The experiment is this—Let two non-elastic bodies, of different masses, meet each other in opposite directions, with velocities inversely proportional to their masses, the momentum of each will be destroyed, for after the stroke there will be no motion.

To this I will add another: Let two holes of equal areas be made in a vessel containing water, one four feet and the other sixteen feet below the surface of the water in the vessel; it is known that the velocity of the water issuing from the lower hole will be double that of the other, and the quantity of water double in a given time. It is also known, by experiment, that the pressures which these two streams make by impulse against solid planes brought up near the openings, are as four to one. Now the quantity of matter being double, if the momentum is as the square of the velocity, the pressure should be as eight to one.

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* See Journal of Franklin Institute, vol. iv. p. 213.

By referring to the article mentioned above, the reader will find that there is a distinction to be made between momentum, or force, and mechanical power, and that it is only the latter which follows the law of the squares of the velocities.

Very respectfully, yours,
J. P. Espy.

Notes of an Observer.—*On the aberration of Light as a means of testing the Cartesian and Newtonian theories of Light.*

In this country, and also in England, the Newtonian theory of light has been almost universally received, both as to colours and to the nature of light, as consisting of material particles projected from luminous bodies. It has, however, been lately shown by Dr. Brewster that the prismatic spectrum is capable of being further analyzed, and that there are but three colours, red, yellow, and blue, and that the intermediate colours are formed by the overlapping of the two contiguous ones.

This analysis was made not by the prism alone, but by letting each of the prismatic colours fall on coloured glass, and he found that when orange, for example, fell on a coloured glass which would absorb red and transmit yellow, the orange was analyzed, for nothing but yellow was transmitted; and when a different coloured glass was used, the red was transmitted, and the yellow absorbed; thus showing that the prismatic orange consists of two kinds of rays of the same refrangibility, but of different colours; and so of green and violet.

It appears also, from the following experiment, that the rays of the same colour, are of different refrangibility.

Let the solar light, after it is separated by the prism, fall upon a thin piece of smalt-blue glass, of proper thickness, and "the red light will be separated into two well defined portions, parted from one another by a broad and perfectly black band, and wholly undistinguishable in colour. Of these, the lowest, or least refrangible, corresponds to the extreme red of the spectrum, and is a perfectly homogeneous light; the other is nearly homogeneous, and without the slightest shade of orange. The orange is altogether obliterated, the next colour being a well defined band of pure and full yellow, which is separated from the second red by a small well defined black line, and from the green by a dark interval." See Lloyd on Light and Vision.

These experiments leave no room to doubt that there are only three primary colours; but as to the nature of light, whether it is caused by radiation or undulation, though the latter theory is evidently gaining ground, it is not yet decided, no decisive experiment having been discovered to settle the matter.

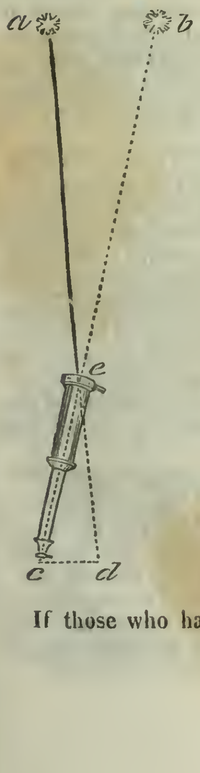
It is acknowledged that, if the Newtonian theory is correct, light moves with greater velocity upon entering a denser medium, from a rarer; but according to the undulatory theory it moves slower upon entering a denser medium.

This being the fact, I propose the following as an experimentum crucis to decide the question.

Let two telescopes be directed to some star near the pole, which passes the meridian above the pole near midnight, and be firmly fixed in such position that a transit will take place at the same instant over a particular division of the micrometers in each of the telescopes. Let the instruments remain in this position for several successive nights, so as to be sure the transit takes place in both at the same instant; then let one of the telescopes be filled with some transparent fluid, as water, having previously made the arrangement to effect this, and also to accommodate the focal distance without changing the position of the instrument. Let a transit of the same star be now observed; if the light moves faster in the water than in the air, the transit will take place sooner in the water telescope than in the air one; but if the light moves slower in the water than in the air, the effect will be the reverse.

If, for example, the light moves only with half the velocity in water that it does in air, the difference in space of the transits in the two instruments will be twenty seconds of a great circle, and if a star be chosen near the north pole, it may amount to many seconds of time.

My view may be explained by the following figure.



Let *a d* be a ray of light passing from a star, *a*, and falling on the object glass of a telescope at *e*. It is known from the aberration of light that if the telescope, from the motion of the earth in her orbit, moves from *c* to *d*, while a ray of light moves from *e* to *d*, that the star *a* will appear in the direction *c b*, and be twenty seconds of space from its true position. If now, as the Newtonian theory requires, a ray of light, upon entering a telescope filled with water, or sulphuret of carbon, should move faster than it does in air, then the telescope could not move from *c* to *d*, while the ray of light is moving from *e* to *d*, and, of course, the star would not appear to be twenty seconds from its true place, and would be seen in some place between *a* and *b*—nearer to *a* as its velocity is greater, and finally at *a*, if the velocity is infinite. If, on the contrary, as the Cartesian hypothesis requires, the ray of light begins to move slower upon entering the fluid telescope, then will the telescope be carried by the motion of the earth farther than from *c* to *d*, while the ray of light is moving from *e* to *d*, and of course the star will appear more than twenty seconds from its true place.

If those who have the means of making this experiment should avail themselves of it, and communicate the result to the public: it would gratify at least the writer of this article.

Ever Pointed Pencils.

We should be at a loss to name an article which in so short a space of time had so completely won the favour of the public, and put out of use one which was possessed by almost every person, and worn in almost every pocket, as has the ever pointed pencil. What may next be done in this age of rapid improvement, we may probably learn to-morrow; we think, however, that it will not appertain to an instrument of this kind, excepting it may be in its embellishments, as in point of utility it seems well to deserve the motto of *ne plus ultra.*

It ought to be universally known that the inventor of this ingenious instrument, was not himself the patentee. We are indebted for it to Mr. John J. Hawkins, civil engineer, a citizen of the United States, although a native of England, and now a resident there. Mr. Hawkins lived for several years in Philadelphia, but returned to England some five and twenty years ago, with the intention, however, of soon returning to the United States, an intention which he has always cherished, and in writing to his friends here, he has uniformly expressed the hope of soon returning *home.*

Mr. Hawkins might readily supply a new version of "A Century of inventions" made by himself; many of them manifesting talents of a very high order, but in most instances not calculated to increase his fortune in this age of utility; and in those which might have done so, as in the case of the ever pointed pencil, which he sold to Mr. Mordan for a small sum, the fruits of his genius have been reaped by others.

At one period Mr. Hawkins was the proprietor of a very interesting museum in London, consisting almost entirely of his own mechanical contrivances. It served as a striking proof of the fertility and versatility of his genius, but as its merits could not be appreciated by "the million," it brought him no other reward. We have now, among our papers, a catalogue of this exhibition, and may hereafter particularly notice some of its contents. The Physiognotrace, by which so many thousand profiles have been taken, first at Peale's museum in Philadelphia, and subsequently in numerous other places, was invented by him, as also was another ingenious instrument, the Manifold Letter Writer, operating likewise upon the principle of the pentagraph, by which two or three pens were made to act by the direction of one.

We have been led to the recording of the preceding remarks and memoranda, from having recently obtained a very beautifully finished ever pointed pencil from the manufactory of Mr. Wm. H. Hale, of Brooklyn, New York. Although the manufacture has become one of great extent in this country, it is but recently that the productions of our workshops have been able to vie with those of England in point of high finish and embellishment, but such is now the case, and the one to which we have just alluded, is the most elegant and tasteful that we have seen. We had recently noticed in the shops some which were ornamented in the same style, but whether or not by the same hand, we cannot tell; if they were, they exhibit the imperfection usually attendant on earlier efforts, whilst that before us manifests the effect of accurately made machinery, directed by the hands of skill and taste. The ornamenting of the stem is of the kind very properly denominated *damask;* the pattern is produced by a ground formed by the ruling of fine lines upon a polished surface, leaving a brilliant wreath of flowers and foliage, which has the appearance of being raised above the ground. The point through which the lead passes, we observe, is of steel; an improvement that renders permanent the part which was most liable to fail. If we have any objection to this pencil it is its great beauty, which we are unwilling to mar by forcing it into the company of penknives and cents.

EDITOR.

FRANKLIN INSTITUTE.

Continuation of the Report of the Committee of the Franklin Institute of Pennsylvania, appointed May, 1829, *to ascertain, by experiment, the value of Water as a Moving Power.*

(Continued from p. 157.)

WHEEL NO. II.

THE foregoing tables contain the results of the different experiments made with wheel No. I. These being finished, that wheel was removed and No. II. (fifteen feet in diameter,) substituted for it, upon the same axis. The breast was altered to adapt it to the curvature of the wheel, and the requisite change made in the tail race.

The proportion of friction in wheel No. II. to the weight, was ascertained by the method already described as having been applied in the case of No. I. This gave one per cent. for the ratio in the wheel as well as in the drum above. The reduction in the ratio of friction having taken place in both the wheel and drum, seems to point to the increased smoothness of the gudgeons, and their supports, as the cause of the diminution.

We proceed to calculate the amount of friction for the different weights applied in the experiments. The plan pursued will be that adopted in determining the friction of wheel No. I.

First. Constant *inactive* weight borne by the gudgeons of the wheel and drum during the experiments.

Weight of the wheel, - -	1900 lbs.	
Weight of that part of the chain which was between the barrel of the shaft and the drum,	264 ,,	
Weight of the drum, - -	200 ,,	
Total constant *inactive* weight, -	2364 lbs.	
Friction upon this at one per cent, -		23.64 lbs.

Second. Constant weight *resisting* the mo-

tion of the wheel, and which was borne by the gudgeons of the wheel and drum.		
That part of the chain which was between the barrel of the shaft of the wheel and the ground,	20 lbs.	
The iron basket used to contain the weight,	126 ,,	
Three bars of lead weighing together	111 ,,	
Total constant *resisting* weight,	257 lbs.	
Friction due to this weight at one per cent.		2.57 lbs.
Total friction from *constant weight,*		26.21 lbs.
The centre of gravity of the water in the buckets of the wheel, when supplied by chute No. 3, (Fig. II. Plate V.) was 5.00 feet from the axis of the wheel, and the barrel about which the chain was wound was one foot from the same axis; hence, to raise 257 lbs. the constant resisting weight, and overcome a friction of 26.21 lbs. the constant friction just found, required a weight of water of	56.64 lbs.	
Friction due to this at one per cent.		.57 lb.
Whole amount of friction when 257 lbs. was raised,		26.78 lbs.
To find the additional friction due to each of the bars of lead which were used as weights, we have,		
Weight of the lead,	103.00 lbs.	
To balance this weight and the friction due to it, (103 lbs.+1.03 lb.) or 104.03 lbs., required, at 5 feet from the axis, a weight of water of	29.81 ,,	
Total,	123.81 lbs.	
Friction for each bar of lead,		1.24 lb.

An examination of the amount of friction at the several chutes in wheel No. I. showed such slight variations for the friction due to each lead, that it was not considered necessary to apply calculation to each of the chutes by which water was admitted to wheel No. II., the friction was taken as just determined for all the experiments with this wheel. The distances of the centre of gravity of the loaded part of the wheel when water was admitted through the different chutes, were for chute No. 1, 4.61 feet, for No. 2, 5.1, No. 3, 5.0, No. 4, 4.2.

When eight leads were added to the constant weight in the basket the end *o* (Plate III. vol. vii.) of the shaft was suspended. By a calculation exactly similar to that given in page 79, vol. viii. the friction for each lead, after the eighth, was found to be 2.95 lbs.

Plate V.

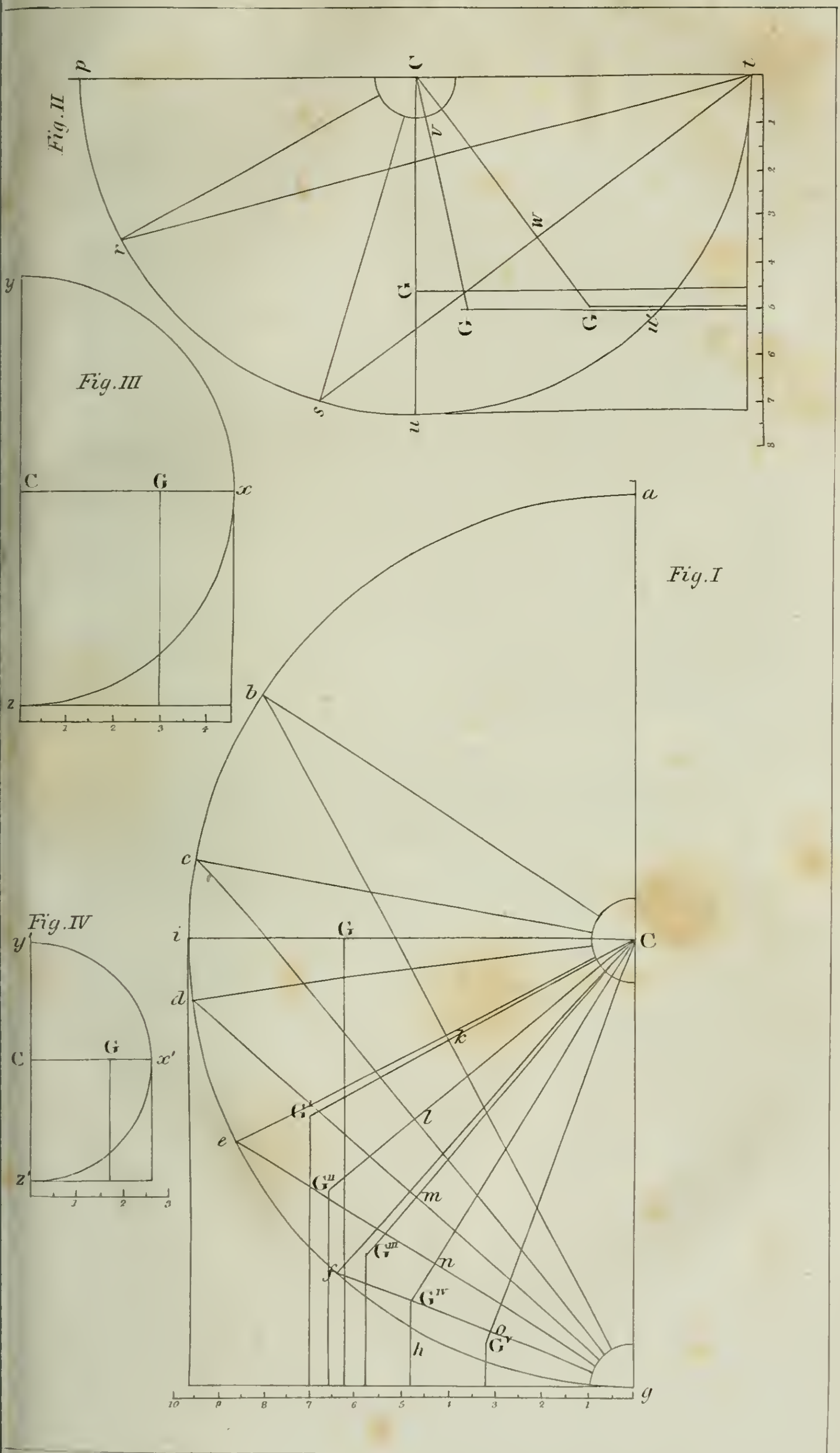


Fig. I
a
b
c
i
G
C
d
k
l
e
G'
G''
m
G'''
n
f
G^IV
h
o
G^V
g
10 9 8 7 6 5 4 3 2 1
Fig. II
p
C
t
v
w
r
G
G
G
u'
s
u
1 2 3 4 5 6 7 8
Fig. III
y
C
G
x
z
1 2 3 4
Fig. IV
y'
C
G
x'
z'
1 2 3

We proceed to the details in relation to wheel No. II.

This wheel was fifteen feet in diameter, twenty inches in breadth, and sixteen inches in the clear between the cants, which were six inches deep.

The buckets used were of the elbow form, the depth fourteen inches, the width of elbow three inches, and opening at the throat two and three-fourths inches. The number of buckets was fifty.

It was not considered necessary to furnish these buckets with air vents, the results of experiments upon wheel No. I. having been, in the upper gates, decidedly unfavourable to their use.

The water was applied to this wheel at four different points. No. 1, was an overshot aperture. The height of the point at which the water from No. 2 was delivered, was 14.25 feet above the bottom of the wheel. The corresponding height for chute No. 3 was 10.46. For No. 4, 6.96 feet. The chutes were of the form and dimensions of those applied to wheel No. I. The forms of the gates were those used in the corresponding apertures in wheel No. I, chute No. 1, having a gate of the form *c*, Fig. 3, Plate IV. vol. viii.

The order of the experiments was similar to that described in the case of wheel No. I. The water was admitted through one chute, and with a given aperture and head, and the weight raised was varied until the maximum effect had been passed. The opening was next changed, and a similar series of experiments made. Finally the head was changed.

The experiments made upon one point of admission of the water to the wheel, will form the subject of one table. The tables will be distinguished by the small Roman letters, and, when divided, the parts will be designated by the common (Arabic) numerals. The columns, unless in particular cases to be noted, will correspond to those used in the foregoing tables.

It will be observed that the height through which the weight was raised in these experiments, was made exactly forty feet.

The general series of experiments made with this wheel will be followed by a set having for their object to determine the relative openings required, and quantities of water expended in performing a given amount of work in a given time, when the water was applied at different points of the wheel, and with different heads above the gates.

The details in relation to the series just referred to will precede the table of results.

TABLE a.—PART I.

WHEEL No. II.—CHUTE No. 1.—*Elbow buckets. Close breast. Water let on at upper centre of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	5.50	5.75	6.35	1.00	463	29.26	492.26	40.0	19	14.90	1640	20,5	336200	196904	.585			
2					669	31.74	700.74		23	12.30	1935		396675	280296	.706			
3					772	32.98	804.98		25	11.32	2150		440750	321992	.730			
4					875	34.22	909,22		28	10.12	2400		492000	363688	.739			
5					978	35.46	1013,46		32	8,85	2680		549400	405384	.738			
6					1081	36.70	1117.70		34	8.33	2925		599625	447080	.745			
7					1184	39.66	1223.66		38	7.45	3200		656000	489464	.746	,746	7.45	
8					1287	42.61	1329.61		41	6.90	3515		720575	531844	.738			
9					1390	45.56	1435.56		46	6.15	3800		779000	574224	.737			
10					1493	48.51	1541.51		49	5,78	4125		845625	616604	.729			
11					1596	51.46	1647.46		53	5.34	4475		917375	658984	.718			
12	3.00	3.25	3.85	1.00	978	35.46	1013.46	40.0	46	6.15	2815	18.0	506700	405384	.800			
13					1081	36.70	1117.70		51	5.55	3100		558000	447080	.801	,801	5.55	
14					1184	39.66	1223.66		57	4.98	3460		622800	489464	.786			
15					1287	42.61	1329.61		62	4.57	3865		695700	531844	.764			
16	3.00	3.25	3.85	1.50	1287	42.61	1329.61	40.0	41	6.90	3665	18.0	659700	531844	.806			
17					1390	45.56	1435.56		44	6.44	3900		702000	574224	.818	.818	6.44	
18					1495	48.51	1541.51		48	5.90	4240		763200	616604	.808			
19					1596	51.46	1647.46		52	5.44	4590		826200	658984	.797			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE a.—PART II.

WHEEL NO. II—CHUTE NO. 1.—*Elbow Buckets. Close Breast. Water let on at upper centre of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
20	1.50	2.35	1.75	1.50	875	34.22	909.22	40.0	46	6.15	2630	16.50	433950	363688	.838			
21					978	35.46	1013.46		52	5.44	2925		482625	405384	.840	.840	5.44	
22					1081	36.70	1117.70		58	4.90	3250		536250	447080	.834			
23	1.50	2.35	1.75	1.75	1081	36.70	1117.70	40.0	50	5.66	3220	16.50	531300	447080	.841	.841	5.66	
24					1184	39.66	1223.66		57	4.98	3540		584100	489464	.838			
25					1287	42.61	1329.61		61	4.65	3950		651750	531884	.816			
26	1.00	1.85	1.25	1.75	669	31.74	700.74	40.0	46	6.15	2125	16.00	340000	280296	.824			
27					772	32.98	804.98		53	5.34	2425		388000	321992	.829			
28					875	34.22	909.22		59	4.81	2700		432000	363688	.842			
29					978	35.46	1013.46		65	4.35	2960		473600	405384	.855	.855	4.35	
30	0.84	1.69	1.09	1.75	463	29.26	492.26	40.0	43	6.60	1553	15.84	245995	196904	.800			
31					566	30.50	596.50		53	5.34	1826		291238	238600	.819			
32					669	31.74	700.74		60	4.72	2130		337392	280296	.830	.830	4.72	
33					772	32.98	804.98		68	4.17	2450		388080	321992	.829			
34	0.75	1.60	1.00	1.75	463	29.26	492.26	40.0	61	4.65	1497	15.75	235777	196904	.834			
35					566	30.50	596.50		68	4.17	1816		286020	238600	.834			
36					669	31.74	700.74		83	3.41	2116		333270	280296	.841	.841	3.41	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE b.—PART I.

WHEEL No. II.—CHUTE No. 2.—*Elbow buckets. Close breast. Bottom of gate* 14.25 *feet above bottom of wheel.*

No. of Exper't.	Head of water above. Btm. of gate.	Head of water above. Top of bkt.	Head of water above. Btm. of bkt.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Feet.	Feet.	Feet.	In.	Pds.	Pds.	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	2.25	2.75	3.93	1.25	1287	42.61	1329.61	40.0	67	4.22	4335	16.50	715275	531844	.743			
2					1390	45.56	1435.56		73	3.88	4680		772200	574224	.743			
3	1.50	2.00	3.18	1.25	463	29.26	492.26	40.0	36	7.87	1610	15.75	253575	196904	.776			
4					566	30.50	596.50		40	7.08	1920		302400	238600	.789	.789	7.08	
5					669	31.74	700.74		45	6.29	2275		358312	280296	.782			
6					772	32.98	804.98		54	5.24	2620		412650	321992	.779			
7					875	34.22	909.22		60	4.72	2970		467775	363688	.777			
8					978	35.46	1013.46		68	4.17	3330		524475	405384	.773			
9					1081	36.70	1117.70		74	3.82	3700		582750	447080	.767			
10	1.00	1.50	2.68	1.50	463	29.26	492.26	40.0	35	8.12	1675	15.25	255437	196904	.767			
11					566	30.50	596.50		42	6.74	2000		305000	238600	.782			
12					669	31.74	700.74		49	5.78	2340		356850	280296	.785	.785	5.78	
13					772	32.98	804.98		55	5.15	2700		411750	321992	.782			
14					875	34.22	909.22		68	4.17	3080		469700	363688	.774			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE b.--PART II.

WHEEL NO. II.—CHUTE NO. 2.—*Elbow buckets. Close breast. Bottom of gate* 14.25 *ft. above bottom of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
15	1.00	1.50	2.68	1.75	566	30.50	596.50	40.0	37	7.65	2015	15.25	307287	238600	.776			
16					669	31.74	700.74		43	6.60	2340		356850	280296	.785			
17					772	32.98	804.98		48	5.90	2660		405650	321992	.793	.793	5.90	
18					875	34.22	909.22		54	5.24	3015		459787	363608	.791			
19					978	35.46	1013.46		66	4.27	3390		516975	405384	.784			
20					1081	36.70	1117.70		73	3.88	3790		577975	447080	.773			
21	0.75	1.25	2.43	1.75	463	29.26	492.26	40.0	46	6.15	1700	15.00	255000	196904	.772			
22					566	30.50	596.50		52	5.44	2025		303750	238600	.785			
23					669	31.74	700.74		55	5.15	2370		355500	280296	.788	.788	5.15	
24					772	32.98	804.98		65	4.35	2740		411000	321992	.783			
25					875	34.22	909.22		73	3.88	3100		465000	363688	.782			
26					978	35.46	1013.46		79	3.58	3445		516750	405384	.784			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE C.

WHEEL NO. II.—CHUTE NO. 3.—*Elbow buckets. Close breast. Bottom of gate* 10.46 *feet above bottom of wheel.*

No. of Exper't.	Head of water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pds.	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	3.04	4.04	5.22	1.25	978	35.46	1013.46	40.0	46	6.15	4900	13.50	661500	405384	.612	.612	6.15	
2					1081	36.70	1117.70		56	5.06	5650		762750	447080	.586			
3					1184	39.66	1223.66		65	4.35	6410		865350	489464	.565			
4	2.04	3.04	4.22	1.25	772	32.98	804.98	40.0	46	6.15	4100	12.50	512500	321992	.628			
5					875	34.22	909.22		50	5.66	4550		568750	363688	.639	.639	5.66	
6					978	35.46	1013.46		61	4.65	5210		651250	405384	.622			
7	1.04	2.04	3.22	1.75	669	31.74	700.74	40.0	36	7.87	4025	11.50	462875	280296	.605			
8					772	32.98	804.98		44	6.44	4200		483000	321992	.666	.666	6.44	
9					875	34.22	909.22		50	5.66	4790		550850	363688	.660			
10					978	35.46	1013.46		55	5.15	5410		622150	405384	.651			
11					1081	36.70	1117.70		63	4.50	6025		692875	447080	.645			
12	0.79	1.79	2.97	1.75	772	32.98	804.98	40.0	52	5.44	4275	11.25	480937	321992	.670			
13					875	34.22	909.22		57	4.98	4775		537187	363688	.677			
14	0.79	1.79	2.97	2.00	669	31.74	700.74	40.0	44	6.44	3680	11.25	414000	280296	.677	.677	6·44	
15					772	32.98	804.98		48	5.90	4275		480937	321992	.670			
16					875	34.22	909.22		55	5.15	4870		547875	363688	.663			
17					978	35.46	1013.46		63	4.50	5510		619875	405384	.653			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

TABLE d.

WHEEL No. II.—CHUTE No. 4.—*Elbow buckets. Close breast. Bottom of gate* 6.96 *feet above bottom of wheel.*

No. of Exper't.	Head of Water above.			Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Maximum effect.	Velocity at maximum.	Observations.
	Btm. of gate.	Top of bkt.	Btm. of bkt.															
	Feet.	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.						
1	3.04	4.21	5.39	1.00	566	30.50	596.50	40.0	41	6.90	4200	10.00	420000	238600	.568	.568	6.90	
2					669	31.74	700.74		49	5.78	5150		515000	280296	.544			
3					772	32.98	804.98		61	4.65	6260		626000	321992	.514			
4	3.04	4.21	5.39	1.25	566	30.50	596.50	40.0	36	7.87	4320	10.00	432000	238600	.552			
5					669	31.74	700.74		41	6.90	4900		490000	280296	.572	.572	6.90	
6					772	32.98	804.98		51	5.55	6100		610000	321992	.527			
7	2.04	3.21	4.39	1.75	566	30.50	596.50	40.0	37	7.65	4400	9.00	396000	238600	.602	.602	7.65	
8					669	31.74	700.74		45	6.29	5310		477900	280296	.586			
9					772	32.98	804.98		56	5.06	6500		585000	321992	.550			
10	1.04	2.21	3.39	1.75	360	28.02	388.02	40.0	38	7.45	3080	8.00	246400	155208	.630			
11					463	29.26	492.26		48	5.90	3900		312000	196904	.631	.631	5.90	
12					566	30.50	596.50		58	4.90	4875		390000	238600	.611			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

Quarterly Meeting.

The thirty-third quarterly meeting of the Institute was held at the Hall of the Institute April 19, 1832.

THOMAS FLETCHER, Vice President, in the chair.

The minutes of the last meeting were read and approved.

The quarterly report of the Board of Managers was read and accepted, when, on motion, it was referred to the standing committee for publication.

The quarterly report of the Treasurer was read and accepted.

The Corresponding Secretary read a communication from the American Institute of the city of New York, accompanied by one hundred copies of the address delivered before that Institute by the Hon. Edward Everett at their last Annual Fair; the address was then distributed among the members of the Institute present.

The committee appointed to inquire into the statistical wealth of the state, reported that the labours of the sub-committee for Dock ward were finished, the tables of which were presented, showing that the value of the domestic manufactures of that district amounted to upwards of seven hundred thousand dollars.

On motion, the thanks of the Institute were presented to the sub-committee for Dock ward for the promptness with which they had attended to the duties assigned them.

On motion, it was.

Resolved, That the committee on statistics be authorized to adopt such measures as they may deem adviseable for the purpose of procuring a sufficient amount of funds to defray the expenses that will be incurred in the prosecution of the duties assigned to them.

The following donations were presented to the Institute.

By Messrs. Carey & Lea.

Lardner's Cabinet Cyclopædia, No. 13, *on Silk, and No.* 14, *on Natural Philosophy.*

A Geological Manuel, by H. T. De La Beche.

Renwick on the Steam Engine.

By Profr. Alexander Dallas Bache.

Report of Committee of American Philosophical Society on Astronomical Observations, February 12, 1831.

By Isaac Hays, M. D.

Euclid's Geometry, by Bonnycastle.

Experiments on Anthracite, Plumbago, &c. by Lardner Vanuxem.

By Reuben S. Gilbert.

The Cabinet of Natural History and American Rural Sports, vol. 1.

The Corresponding Secretary laid on the table the following works received in exchange for the Journal of the Institute, viz.

London Journal of Arts and Sciences, for October, November, and December, 1831, and January and February 1832.

Repertory of Patent Inventions, October, November, December, and Supplement, 1831, and January and February, 1832.

Mechanics' Magazine, for September, October, and December, 1831, and January, 1832.

Register of Arts and Journal of Patent Inventions, for October, November, and December, 1831, and January and February, 1832.

Recueil Industriel, for July and August.

Bibliothéque Physico-économique, for September, October, November and December.

Annales de Chimie et de Physique, for June, July and August.

Bulletin de la Societé d'Encouragement pour l'Industrie Nationale, for July, August, and September.

Annales des Mines, 5th and 6th book, 1830.

North American Review, January and April.

American Annals of Education, January, 1832.

Journal of the Philadelphia College of Pharmacy, for January and April.

The American Quarterly Review, for March.

Ladies' Book, for January, February, March and April.

The American Journal of Arts and Sciences, for January.

The Southern Review, for February.

Museum of Foreign Literature and Arts, for January, February, and March.

The Illinois Monthly Magazine, for January and February.

THOMAS FLETCHER, *V. President*.

J. HENRY BULKLEY, *Rec. Sec.*

Thirty-third Quarterly Report of the Board of Managers of the Franklin Institute.

To the Franklin Institute of the state of Pennsylvania for the promotion of the Mechanic Arts, the Board of Managers offer their thirty-third quarterly report.

The closing winter has been, as usual, a season of active usefulness. The lectures delivered regularly by our several professors, have continued to attract attention, and to convey instruction. It is a matter of regret that but few of our members avail themselves of the opportunity of delivering volunteer lectures; a branch of our duties from which much benefit had been expected at the outset of the Institute. Our schools have also continued as announced in our last report, and the Board entertain the opinion of their usefulness and importance that was then expressed.

The investigations commenced by the Institute are continued with all due attention. The experiments on steam boilers have been carried very far, and that part which embraces the properties of steam and the various phenomena which it exhibits under different circumstances, may be said to be nearly completed. Preparations have been made to investigate the strength of the various kinds of iron and of copper used in the construction of steam boilers. To effect this successfully a machine has been constructed under the directions of the sub committee to which this branch has been intrusted. The expenditure on account of this machine, though considerable, is believed to have been judicious, as it enables us to test the strength of all the different kinds of iron or copper, and at different temperatures; indeed to test the strength of any material which may be used in the arts. This expense will be defrayed from the fund which has been so liberally placed at the disposal of the Institute. In order to derive as much benefit as possible from this machine, the Institute invite their members and the public at large, to send any specimens of iron, &c. the strength of which it is desired to ascertain; they may be directed to William Hamilton, Actuary of the Institute; and the Board pledge themselves that every variety sent will be fairly and strictly tested, under the superintendence of the appropriate committee.

The investigation into the statistical wealth of Pennsylvania has led to some expenses which the Board have been called upon to defray; one hundred dollars have already been appropriated to this purpose, and it appears that there is still a balance of about fifty dollars due to meet past disbursements. In adverting to this fact, and to the circumstance that if the investigation is likely to be useful, it must be at a considerable additional expense for postage, printing, clerk hire, &c., the Board would respectfully submit to the Institute that the funds of the society are so limited in extent, and so imperiously required for other necessary expenditures, that it seems to them desirable to defray the expenses of the statistical investigation from a separate fund, which it is believed could be raised by subscription among those most interested in its result. Probably a sum of $500 or $600 would be sufficient for the purpose, and it is not unlikely that it could be raised by some exertion on the part of the members.

The Board have taken some preliminary steps towards the better arrangement and disposition of their cabinet of models, &c.

All which is respectfully submitted by

William H. Keating, *Chairman.*

William Hamilton, *Actuary.*

Notice of some assertions made by Mr. Joshua Shaw in the Journal of the Institute for September last, on the subject of Percussion Locks for Cannon, by the writer of the article under the signature of Justice.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—The writer of the article signed "Justice," which appeared in your Journal for May last, has recently met with a rejoinder which occupies six pages of the number of the Journal for September last.

It is not designed to travel over the whole of this huge and laboured production, nor to detect and expose the numberless errors of fact and inference with which it abounds. But with your permission, and with due respect for the maxim quoted in your appended note, a few remarks will be offered in reply.

The first publication on this subject, did, in effect, accuse Lieut. Bell of pilfering from Mr. Shaw an invention which he afterwards patented. It was the purpose of "Justice," in his reply to that publication, to repel this foul aspersion, and that purpose was effectually accomplished by reference to dates and documents which are incontrovertible. This point has not been touched, nor even approached, in any of the discursive wanderings of this enormous rejoinder, and hence it is regarded as being wholly abandoned by Mr. Shaw. Here we might rest the matter, and would do so, but for a denial on a collateral point which requires a brief notice.

"Justice" stated that it was a matter of official record, that the principle of applying percussion locks and primers to the firing of cannon, had been suggested to Mr. Shaw by another more than eight years before that time, (April 1831.) This statement is met by a positive denial, and "*Justice*" is thereby accused of falsehood. Mr. Shaw says, "if it be on official record that this invention of mine was communicated to me more than eight years ago, what ignorant individuals must preside," &c. after which he comes directly to the point, and says, "I deny that information was ever conveyed to me from any quarter, that furnished *any*, even the most distant hints of my invention." And then refers to certain experiments made at Frankford, November 20, 1823, in support of that denial. This date is the earliest quoted by Mr. Shaw. Now, let him be asked, if he will dare to deny that these very experiments which he here cites as the foundation and the sustaining prop of all his claims, were not made in pursuance of suggestions communicated to him by another a long while before? Let the following extract from an "official record," answer.

Extract of a letter to J. Shaw, of Philadelphia, dated 12th February, 1823.

"It is contemplated to make some trials in the application of the detonating powder to cannons by means of a lock to be prepared for that purpose, and to be permanently attached to the gun. I have to request that you will prepare a few primings for this purpose. I conceive that the copper caps should be much larger for cannon, than those for small arms, and they should contain about three times the quantity of powder. The primings for cannon must necessarily be much stronger, because the fire must be transmitted a much greater distance, (say six or eight inches,) and must penetrate the flannel bag which contains the powder. These circumstances should be taken into consideration, and provided for, in preparing the primings. It will be necesary also, that the lock should be proportionably strong, which will be attended to when made."

It should be borne in mind that this letter was written at a time when the application of detonating powder and percussion locks to the firing of *small arms* was well known and in general use. The application of the same principle to the firing of *cannon* was first suggested in that letter; or, it is at least the first known to the writer; if there be any of earlier date, let it be shown by Mr. Shaw.

JUSTICE.

April, 1832.

Note by the Editor.—The note to which our correspondent alludes will be found at page 159 of our last volume. It was then supposed that if any rejoinder was offered to the remarks of Mr. Shaw, it would immediately have followed the publication of his article; the removal to a distant part of the Union of the gentleman who writes under the signature of *Justice*, prevented his seeing Mr. Shaw's last communication, and has consequently delayed the appearance of *this final* notice.

Decision of the Supreme Court of the United States, in a case involving the question of the Validity of a Patent, which has been surrendered and reissued on an Amended Specification.

It has been the practice in the Patent Office to allow a patentee to surrender his patent, in order to allow of his amending a specification which through inadvertence, or a want of information respecting the requirements of the law, had been defective; the reissued patent, in such cases, always bearing the same date with the original patent. No formal decision, however, had taken place in the courts of the United States, establishing the correctness of this procedure, in regard to which the law itself had not made any provision. This question has been finally settled at the recent term of the Supreme Court.

The case which brought this question before the court was that of E. & H. Raymond *versus* Grant & Townsend.

This was an action to recover damages for an infringement of the right of the plaintiff, Joseph Grant, under a patent granted in April, 1825, a former patent for the same thing having issued in August, 1821, but which having been surrendered owing to a defective specification, had been cancelled of record, and the second issued to continue for fourteen years from the date of the first.

One of the pleas filed by the defendants was that the specification did not correctly and accurately describe the improvement claimed, that it did not furnish any account of the sizes or proportions of the respective parts of the machine, nor describe its manner of operating in those full, clear, and exact terms required by the law. The plaintiffs, in reply, aver that neither their description, or the drawings annexed thereto, are in any way deficient.

On the trial, the counsel for the defendants objected that the Secretary of State had no power by law to accept a surrender of, and to cancel, said letters patent. The court, however, decided that such surrender might be made, when the defect arose from inadvertence or mistake, and without any intention of fraud on the part of the patentee. To which decision the counsel for the defendants excepted.

After adducing testimony, the counsel for the defendants moved the court to instruct the jury that if the specification was proved to be defective, that they must find for the defendants; which instructions the court refused to give, but instructed the jury that the patent would not be void on account of such defect, unless it arose from design, and for the purpose of deceiving the public. To this opinion the counsel also excepted.

The jury found a verdict for the plaintiffs, and assessed the damages to $3266 66, the judgment on which was brought before the Supreme Court, by a writ of error.

In giving its decision in this case, it was observed by the court, that "the first question in the cause, respects the power of the Secretary of State to receive a surrender of a patent, and to reissue it under an amended specification for the unexpired part of the term. The court was of opinion that although the law did not make any direct provision allowing of such a surrender, and the reissuing of a patent under an amended specification, yet such a proceeding seemed to accord with its general spirit. That the public still obtained every thing which was intended to be secured to it; and that the sense of justice and of right which all feel pleads strongly against depriving the inventor of the compensation solemnly promised to him, because he has committed an inadvertence, or innocent mistake. Every one, it was observed, would acknowledge the propriety of issuing a new patent, if an error had been committed in the Department of State, yet this would be done without any thing in the law to authorize it; and why should not the same step be taken for the same purpose, if the mistake has been innocently committed by the inventor himself? The executive department, it is understood, have acted upon the construction adopted by the Circuit Court, and have considered it as settled. We would not willingly disregard the settled practice in a case where we are not satisfied it is contrary to law, and where we are satisfied that it is required by justice and good faith."

This is the only point involved in this case which we deem it necessary to lay before our readers at present, as we shall hereafter republish in this journal our Digest of the Decisions of the United States in Cases arising under the Patent Laws, made by order of Congress, and published with the general list of patents. When we do this, we shall append thereto such further information and remarks, as subsequent decisions, and the amendments which may be made to the patent laws, may render necessary.

Editor.

Bibliographical Notices.

Lardner's Cabinet Cyclopædia.

Hydrostatics and Pneumatics, by the Rev. Dionysius Lardner, with Notes by Benjamin F. Joslin, M. D., Professor of Natural Philosophy in Union College. First Am. from 1st Lond. Ed. Carey & Lea. 1832.*

This is the thirteenth number of the excellent series of treatises comprised in the Cabinet Cyclopædia, the republication of which in this country we owe to Messrs. Carey and Lea. If called upon to state our preference of one or other of the two treatises on Natural Philosophy, namely, of the Mechanics or of the Hydrostatics, we should pronounce in favour of this latter work. The style is more popular throughout. Each step in the subject is explained by reference to a supposed experiment, and thus the reader has before him a representation of precisely what the author means to convey by his proposition. The mind is in this way led forward from the consideration of the more simple truths to the complex phenomena of both Hydrostatics and Pneumatics.

When so much depends upon the figures illustrative of the text, it is to be regretted that the publishers have given such inferior cuts: we have rarely seen worse specimens of the art than some of them afford. The models from which they were taken in the English work are not remarkable for either great accuracy or elegance, but in the latter quality, if not in the former, they surpass the American copies.

The publishers have taken the pains to secure an editor for the American edition of this work. In running over the text we observe that many errors of inadvertency in the English edition are corrected, and some which can hardly admit of the application of so mild a name, pointed out in the notes at the foot of the page. We could have wished that whenever the author was certainly wrong the American editor had altered the text without involving the reader in any discussion, permitting him thus to suppose that there could be two views taken of the subject. The American editor has taken this course in the tables pages 217 and 218, which were altogether incorrect in the English edition, and which are made accurate in this, (if we except one typographical error,) without noticing the change.

It would be but an ungrateful task to point out trivial errors in the figures and text which remain uncorrected, and having holes in our own coats requiring mending, we would be chary in pointing out those in the garments of our neighbours. We will even resist a disposition to criticise the sphere said (page 15) to have a bottom, a top, and sides, which has escaped the eye of the American editor, and the contracted vein (fig. 68) with *diverging* sides.

Such errors speak for themselves, and throw but little impediment in the way of a clear sighted reader. The readers of our journal would probably include in this class also the sixty pounds pressure upon a square inch, which they are told (page 37) by Dr. Lardner "considerably exceeds that which is produced in most high pressure steam engines." There are inaccuracies, some of which, as calculated to impress erroneous conclusions upon readers, we will notice.

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* Com. Pub.

First, then, the remarks on page 85, where, as the basis of reasoning, is assumed what is now known not to be true, that salt water has a point of maximum density. To be more explicit, that at a certain temperature, salt water is denser than at either higher or lower temperatures. The remarks of Dr. Lardner are very philosophic as applied to collections of fresh water, the limited depth of which renders the provision of which he speaks of immense importance.

Such is not the case in regard to the ocean, of which the great depth, and the interchange of the cold and dense waters of the polar seas, with the warmer and lighter waters of the equatorial regions, prevent any very considerable reductions of temperature. The anomalous action is not needed in the ocean, and there we do *not* find it.

We object also to the idea that "*pure*" mercury (page 196) can be obtained by straining the impure metal through chamois leather, and that no other purification is required to rid the metal of the "*solid*" substances which it takes up. If alloyed with lead, tin, or bismuth, which would materially affect the specific gravity of the metal, and therefore its use in the barometer, the straining through chamois leather would not remove the impurities, and recourse must be had to the action of dilute sulphuric acid and to distillation.

In the preparation of calomel much distilled mercury is obtained which allows it to be sold at a lower price than if the process of distillation had been resorted to expressly to procure the metal. It is much to be wished that this pure mercury were substituted in the barometer especially, but also in the thermometer, for the ordinary mercury employed.

The theory of the lifting pump, given page 239, is strangely incorrect. The author supposes the piston of the pump to be loaded in making the upward stroke with a column of water, having for its height the distance from the valve in the piston to the level of the water in the pump. That this cannot be the case is readily seen, since the water in the cistern would certainly rise to its level within the body of the pump. The piston of the pump is urged *upwards* by a force due to a column of water between the piston and the level of the fluid in the cistern, it is urged *downwards* by the column stated by Dr. Lardner, and hence the resulting downward pressure is the column between the level of the fluid in the cistern, and the level of that in the pump.

On the very next page, (240,) we find a pump with a solid plunger classed as a "lifting pump," though the action of the machine *forces* water which has risen into the barrel of the pump in the upward stroke of the plunger, by the downward stroke, into an adjacent tube having a valve at the bottom. The pump is, in few words, a peculiar form of the forcing pump, with a solid plunger.

These few remarks will, we trust, be turned to account in a second edition, by drawing the attention of the American editor more particularly to the fact that errors do really exist in the work, besides those which he has corrected.

Meanwhile we would recommend those who are fond of such reading, to procure the book without fear that the inaccuracies will weigh a feather when compared with its merits. B.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN NOVEMBER, 1831.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in the *Tanning Apparatus;* William Brown, Mooresville, Delaware county, New York, November 2.

The present patent is taken out as an improvement on the apparatus patented by the same gentleman, November 11th, 1830, and consists in a method of removing the refuse bark from the letches without the ordinary labour of shovelling. Those who are interested may refer to our account of the original patent.

There is to be a plug passing through the false bottom, and fitting closely into the true bottom of the letch, closing an opening through which its contents may be discharged. When this is to be effected the letch is filled with water from the reservoir, the contents are then agitated so as completely to stir up the spent bark, when, on withdrawing the plug, the bark and water will run out together through a trunk fixed for that purpose.

2. For an improved *Wheel for a Rail-road Car;* Samuel Krauser, Reading, Bucks county, Pennsylvania, November 2.

We have here another edition, *without improvements*, of Garnett's friction rollers. These rollers, or wheels, are to be connected together by a ring through which their axes pass; between these the axle of the car is to work, whilst they fit within the rim of the main wheel, which forms a box to receive them.

3. For a *Tri-cylinder Machine, operating by Water fall;* Eugene Berganzio, city of New York, November 2.

We begin with the end of the specification of this machine, which although it is not in the form of a claim, assures us of the great value of the invention, by informing us that "two horses will consequently produce the power of twelve." After this, if it is expected that we shall give a particular description of the machine, that expectation will be disappointed. All we shall say is, that two horses, walking in a hollow drum, are to raise water enough, in buckets, to drive a water wheel which shall have the power of twelve horses.

We would suggest an improvement to the patentee, which is, either to shoot, or otherwise dispose of, his horses, as soon as he has fairly set his machine to work, as the water raised by them will still leave the power of ten horses, every two of which may be made to operate upon a machine similar to his first, and thus produce the power of sixty horses, the principle being, of course, applicable *ad infinitum.*

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4. For a *Machine for Drilling or Boring Stone;* William Holdridge, city of Albany, New York, November 2.

Drills, made in the form usually employed for the above purpose, have their shafts passing up through holes in guide pieces, which retain them in their vertical position. The shafts are attached to spring poles, which serve to raise them; and by means of a rope descending from each pole the shaft attached to it is worked up and down. These parts, with a frame to sustain them, constitute the whole machine, no provision whatever being made for the necessary operation of turning the drill as the strokes are repeated. There is no claim made, excepting to the using of any number of drills, and to the making the machine of any size, shape, or material best adapted to it; a right which will not be disputed.

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5. For an improvement in the *Manufacturing of Axes;* Erastus Shaw, and Robert H. Burk, Canton, Hartford county, Connecticut, November 3.

Rollers are to be prepared and geared in the manner of flatting mill rollers; one of these is to be indented; and the other is to have a raised part upon it, leaving, between the two, a proper space for the formation of the axe, so that when bent over, the eye and other parts will have their proper shape. The iron, properly heated, is to be passed between these rollers, and when delivered from them subjected to the action of a press, provided with a punch, or follower, for bending the parts together.

The claim is to the forming the parts of axes by means of rollers, and of doubling them together in a press.

The description is equally general with our notice of it, " the *particular* form of machinery used to carry these principles into operation being deemed unessential." We, however, do not concur with the patentee on this point, for the *general principle* of such a machine is well known, numerous articles having been manufactured of iron by means of rollers; we apprehend, therefore, that to sustain a patent for such a purpose, there ought to be something *special* in the construction of the apparatus, and that such special contrivance should be clearly exhibited.

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6. For a *Composition to be used in the Stiffening of Hats;* Charles Bent, and Francis Bush, Chelmsford, Middlesex county, Massachusetts, November 3.

The materials to be employed in forming an elastic, water-proof stiffening for hats, are borax, rosin, shellac, and copal. Eight ounces of the first, one pound of the second, two of the third, and five ounces of the last, are to be dissolved in five quarts of hot water, the ingredients being put into it in the order stated. The hat bodies are to be saturated with this compound, and then trenchered, leaving the larger portion of the stiffening in the brim. After standing half an hour they are to be put into a weak solution of sulphuric acid, and then soaked in cold water until all the acid is removed, when they are ready for napping.

The patentees state that this process is much cheaper and better than those usually followed, and that by its aid a workman can stiffen three times the number that can be stiffened by the usual method.

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7. For a composition of matter for the *Cure of the Gout and Rheumatism;* William A. Parker, Bellhaven, Accomack county, Virginia, November 4.

This composition of matter is called "Parker's compound vegetable spirit," which is to be extracted from sassafras root and ground ivy. A still is to be filled with "as much of the root," clear water, and about five pounds of ground ivy to the hundred gallons. This is to be boiled for about thirty minutes, removing the scum which rises. About ten gallons are then to be distilled over for every hundred in the still, and when one-sixteenth of 5th proof brandy is added, this spirituous composition of matter is fit for use, and the patient is to take a wine glass full, two or three times a day.

We have no doubt that the foregoing is quite as harmless and as useful as the generality of quack medicines; one thing is certain, its active properties reside in the fifth proof brandy, and so far as grog, or weak toddy is an antidote to gout and rheumatism, the receipt of *Dr.* Parker must be good. We, however, should agree with the members of the temperance society in the opinion that the smaller the dose, the better.

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8. For an improvement in the *Tanning of Leather;* Abraham Conwell, Connersville, Fayette county, Indiana, November 4.

There are to be tubes of communication between each of the vats employed, which are opened or closed at pleasure by means of cocks fixed within the strainers, or leach eyes, and also with a cistern which forms a common reservoir from each of them. The claim is to "the application of the conductors and pipes to the vats, by means of which much labour and bark are saved in the business of tanning." Conductors and pipes have been repeatedly used; we have seen them many years since; not precisely as described by the present patentee, but operating upon the same principle, and answering the same end.

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9. For a machine for *Thrashing Grain*, and cleaning it from smut; Henry Spencer, Maryland, Otsego county, New York, November 7.

The cylinder of this machine is to be of solid wood, one foot in diameter, with beaters upon it, which are also to be of wood, and to consist of pieces one foot in length, and one and a half inch in diameter. In an ordinary sized machine there will be forty-eight of these beaters, standing at right angles to the cylinder, and set so as to form a spiral line round it. The concaves, feeders, &c. vary but little from those commonly used, and we are not told in what the improvement consists, there being no claim.

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10. For an improvement in the *Manner of straightening the Toggle Joint in the Hand Printing Press;* Otis Tufts, Boston, Massachusetts, November 7.

The combination of levers and joints shown in the drawing which accompany this specification, constitutes the claim to a patent; a good idea of this cannot be given in words alone, and we therefore omit the form of the claim. We have had occasion, more than once, to describe variations in this particular apparatus; the relative merits of the different plans cannot be otherwise settled than by direct experience.

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11. For an improvement in the mode of manufacturing *Mattresses, Sofas, and other articles;* Rowland Cromelien, city of New York, November 7.

The mattress here claimed is as nearly like that described at page 128, patented by Mr. French on the 25th of August, as one mattress can well be like another; and if claims can be sustained for differences so small, every man may readily become an inventor, and secure his invention by patent. To the public, however, this will be a point of little importance, provided they obtain a good article, and do not pay any thing for the pretended improvement.

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12. For a process by which the *Borings, Drillings, Filings, or Turnings of Cast Iron are rendered available in the Furnace;* Magradier Mason, Georgetown, District of Columbia, November 8.

(See specification.)

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13. For an improved *Rotary Steam Engine, or Pump;* Oliver Allen, Norwich, Norwich county, Connecticut, November 8.

The attempts at rotary steam engines have been so numerous, that it is scarcely to be expected that any other than new modifications, and methods of obviating the difficulties which have attended their use, should be now brought forward. The present engine, in its general structure, resembles others which have been previously patented, and this is stated by the patentee. There is to be a revolving drum, with a stationary head. Valves are opened and closed by a circular guide piece, so curved as to effect this object in the desired manner. One of the improvements proposed is the making depressions in the head of the revolving drum, or cylinder, over which depressions the edges of the valves pass; these allow the steam to escape at the moment the valve begins to rise, and thus relieve it from the pressure which would impede its opening. Another part claimed as an improvement is the employment of three cocks in a steam box, the keys of which cocks are geared together, so that one lever acts upon the whole; these cocks serve to cut the steam off, or to admit it at either of two openings, so as to stop or reverse the motion of the engine. The following claim notices these and other parts viewed as new. "1st. The manner of fixing and adjusting the circular guide plate for opening and closing the valves. 2nd. The excavations made in the fixed head for relieving the valves from the pressure of the steam before they commence rising. 3d. The mode of giving a lateral adjustment to the cylinder by means of the circular plates inserted into the ends of the casing, and which bear upon the shoulders of the shaft. 4th. The employment of, and the manner of fixing the three cocks for the admission and discharge of steam, when used as a steam engine. 5th. The packing in the grooves of the fixed head, by means of circular metallic rings, borne up by elastic packing, or by springs."

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14. For an improvement in the *Apparatus used for heating Hatters' Irons;* Daniel L. Tuthill, city of New York, November 8.

This furnace is very simple in its structure, and is to be made wholly of metal. The fire place is a cylinder of eight inches in height, and the same in diameter, with a grate at the lower end, and two bars above to support the irons, being exactly like the common cast iron furnaces. The cylinder is to be placed in an iron box, or oven, like that of a common cooking stove, having a hole through its bottom to allow the cylinder to pass through, until it rests upon a rim, or flanch, surrounding its upper edge. The oven is closed by a door, and has a pipe leading from the top, and furnished with a damper to regulate the draft.

The claim is to "the general construction and *application* of the furnace above specified, for the *above mentioned purposes.*"

The *general* construction has certainly but little of novelty in it, nor do we think it very good. The furnace part, if made of clay, brick, or other bad conductor, would be more economical, and less annoying in warm weather. As to the "*application*" to the "*above mentioned purpose*," we apprehend that if the tailor may heat his goose, and the laundress her flat irons, at such a furnace, the hatter may take the same liberty, either with or without a patent therefor.

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15. For an improvement in forming the *Pavement of Streets,* for which a patent issued to John L. Sullivan, Engineer, of New York city, on the 20th of October, 1831, which patent has been surrendered and cancelled on account of a defective specification, and reissued November 9.

The principal difference between the present and former specification consists in the drawing up of the new one with much greater precision than the former, and in the direct mentioning that instead of finishing with the water cement, the patentee sometimes, after the lower stratum of water cement is dry, fills the upper part of the interstices with fusible mineral cement, applied boiling hot, forcing fragments between the stones, as in the former instance.

For our notice of this patent when first issued, we refer to p. 236, in the number for last month.

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16. For a *Thrashing Machine;* Johnson Dawkins, Westport, Oldham county, Kentucky, November 10.

This machine operates by means of flails fixed in rows upon each side of a thrashing floor. The thrashing floor is an inclined plane down which the article to be thrashed is made to pass, the flails operating upon it in its descent. The floor is formed of slats which allow the grain to pass through on to a spout which conducts it down to a winnowing machine. The wheel work and levers by which the flails are to be moved, are placed under the inclined floor.

The claim is to "the before described machine, but particularly the vibrating frames of flails or beaters; the mode in which they are vibrated; the inclined floor, and the openings and spouts for conveying the grain to the winnowing machine."

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17. For *Looking glass back ground to Pictures or other Ornaments;* Isaiah Jennings, city of New York, November 11.

(See specification.)

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18. For a process for *Dying Cotton in the Staple, or Cotton Wool;* James Roy Stewart, Lowell, Middlesex county, Massachusetts, an alien who has resided two years in the United States, November 11.

The object of this patent is to prepare the cotton wool for entering into the composition of cloths of mixed colours. When the cotton has been carded, the laps, or sheets, as they are delivered from the machine, are to be loosely folded so as to bring the extremities nearly together; they are then to be placed between coarse sheets, or secured in any similar way, allowing the contact of water; the cotton thus secured is to be boiled in water for about four hours; the laps are then to be dyed in the manner in which yarn is usually dyed; the boiling, it is said, will prevent all shrinking and matting in the process of dying, and thus remove the difficulty which has heretofore existed in preparing it to be used in mixed cloths.

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19. For a *Machine for Mixing Mortar;* Andrew Kirkpatrick, Urbana, Champaign county, Ohio, November 12.

This machine is designed for mixing mortar for bricklayers, or clay for potters. Two vertical shafts are made to revolve in an oblong tub, with circular ends; the shafts have knives, or breakers, passing through them, which, by their revolution, divide and mix the materials; the knives of one shaft are so fixed as to pass between those of the other. There is to be a hopper above the tub into which the materials are to be placed, and under this a seive, and trough, or chute;

the cog wheel by which the shafts are made to turn, is furnished with cams which agitate the seive. The tub is to contain water, and as the materials fall into this, the revolving knives, or breakers, agitate and mix them.

The claim is to "the foregoing machine, particularly the vertical shafts containing the knives or breakers, and the cams on the double faced cog wheel for shaking the riddle."

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20. For *Elliptical Steel Springs for Carriages;* Charles Hinkle, Northampton Township, Lehigh county, Pennsylvania, November 12.

This elliptical steel spring is, in form, the double bow spring, which we see in use every day, and many times a day. The only *novelty* appears to be that each bow is to be a single plate of steel, instead of several plates one upon the other. "The *invention* here claimed is in making steel springs for carriages of two plates of steel bent to any curve, placed upon each other, and fastened at their ends by lapping, and with rivets, or bolts, and thus forming elliptical springs."

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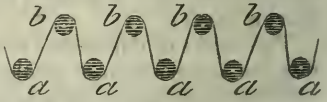
21. For an improvement in the *Machine for Spinning Cotton or Wool;* Levi Rice, Milburn, Somerset county, Maine, November 14.

It appears, judging from the drawing, if such it may be called, that this is intended as a domestic spinning machine, as it is represented as carrying eight spindles only. The band which drives the spindles appears as though it pressed against their whirls, which it is made to embrace by being carried round a roller between each spindle, *a*, *a*, *a*, being the spindles, and *b*, *b*, *b*, the rollers, which are, we suppose, what are designated friction wheels by the patentee. He claims "the putting any number of spindles in motion by one band, by the improvement of the friction rollers, consequently the yarn or thread on each spindle is twisted exactly even, or alike, which cannot be done with a band to each spindle."



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22. For a *Machine for Planing and Dressing Boards, &c.* John W. Newberry, Avon, Livingston county, New York, November 15.

The plane used in this machine has cutting irons fixed in the ordinary manner; but, being intended to cut by its motion in both directions, it has two irons which have inclinations the reverse of each other. The stock has two faces, the planes of which form an obtuse angle at their union in its middle. The plane is made to tilt as it passes backward and forward, so as alternately to bring each face, and cutting iron, on to the board or plank. There is a frame work above with cog wheels, and a rack and pinion, with their necessary appendages for working the sliding frame with the plane, back and forth. There are also proper contrivances for holding the board;

the whole of these are well represented in the drawing which accompanies the specification, to which there are ample references.

There is no claim made, and as the machine is not similar to any other for the same purpose with which we are acquainted, this may not be of any importance.

From its structure, it appears to be calculated for short stuff only, and we think it too complex for general use, even for such stuff. In the greater number of cases, a plane of the ordinary construction, especially in roughing out, will tear the stuff in working in one direction, and indeed, the cases are rare in which even a smoothing plane may be used indifferently either way. This objection must lie against most of the planing machines in which the cutting is not done in a curve.

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23. For a *Self-regulating or Self-directing Rail-road Car;* Lewis Wernwag, Harper's Ferry, Jefferson county, Virginia, November 15.

This car is to have four wheels fixed in the usual way, and half way between these there is to be another pair of wheels of smaller diameter, which last, are the regulating, or guiding wheels. The fore and hind axles run in frames connected together by coupling poles, like those of a common wagon, but of equal length, so as to meet in the centre. The guiding wheels are to operate upon the coupling poles at their point of junction, forcing them laterally, according to the curvature of the road. In the drawing, these guiding wheels are represented as about four-fifths of the diameter of the main wheels. They are connected together by means of a slender iron axle, which has its main bearing in a box at its centre; there are shoulders upon the axle by which it is made to act upon the poles which are connected with the box, or bearing. The guiding wheels are furnished with flanches, like the main wheels, and when the road is curved, these flanches, touching against the edges of the rails, cause the ends of the coupling pole to keep in the centre between the two rails.

There is a jointed lever attached to each side of the carriage, furnished with boxes to receive the axle of the regulating wheels, in order to steady it, whilst they allow it to slide freely endwise.

The claim is to the described method of making rail-road carriages with self-directing wheels and axles, however applied.

Where a road is considerably curved, the vertical edge of the flanch of the guide wheel, acting upon the vertical edge of the iron rail, will occasion much rubbing friction, which will cause them to wear with considerable rapidity. Should this objection prove to be of little moment, the principle upon which they act is undoubtedly good.

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24. For a *Thrashing Machine;* Philip Shaffer, Richmond Township, Bucks county, Pennsylvania, November 16.

"The improvement claimed is the fixing the iron pins, or pickers, firmly in the bars placed on the cylinder, and the removing of one piece of the cast iron bed, and substituting the board to preserve the straw."

The machine is, generally, like its neighbours; some of which, we presume, have the iron teeth fixed *firmly*—at all events, the present patentee does not indicate any new way of doing this. His mode of preserving the straw untangled, we do not quite understand. He says, however, that it is effected by removing a part of the cast iron bed, or curve, under the cylinder, and placing a board to receive and guide the straw.

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25. For *Combined Grist and Saw Mills;* Noah Porter, Boston, Massachusetts, November 17.

The shafts of circular saws, and the spindles of grist mills are to be driven by pinions geared into the same horizontal spur wheel. There are, of course, the necessary fixtures for performing the required operations, but these do not present any thing in the slightest degree new. The patentee appears to be of a similar opinion, as he claims "the general arrangement of the before described combined grist and saw mills, and the mode of throwing the saw mill in and out of gear by the levers, or elevators."

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26. For a machine for *Washing and Wringing Clothes, and for Heating Water;* James Luckey, Troy, Rensellaer county, New York, November 19.

This machine consists of an oblong box, divided into three compartments, in one of which the water is to be heated; the clothes are to be washed in the second, and wrung in the third. A furnace of metal is to be let into one of the compartments of the box, and is to be secured to it by the aid of a flanch. The water in this compartment surrounds the furnace, the smoke being conducted off through a pipe rising from the back end of the furnace. The washing compartment, which is in the centre, is about twenty inches square; in this is to be placed a fluted rubbing board, on the ordinary construction; a rubber, consisting of two or three rollers held in the hand, by means of its frame and handle, is to be passed over the clothes held upon the rubbing board.

The wringing compartment, which is at one end, contains a strong netting, or coarse cloth, attached to a shaft which may be turned by a handle or crank. The clothes to be rinced are placed in this cloth, or netting, and on turning the shaft, by means of the handle, they are twisted round it and the water squeezed out of them.

The claim is to the mode of heating the water; the apparatus for wringing; the rubber, and the general arrangement of the several parts.

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27. For an improvement in the *Machine for polishing and graining, or dicing Morocco, or other Leather;* patented on the

20th of April, 1831; Robert Emes, Boston, Massachusetts, November 21, 1831.

We gave an account of this machine when first patented, which will be found at page 164 of the last volume, with a reference to some machines for the same purpose previously patented. The present specification describes the whole machine, without designating the parts which constitute the improvement. The patentee observes, that by comparing the present specification and drawing with the former, it will be found that there are parts not described in the original, and that these constitute the improvements which he now claims. We do not think that it ought to be left to others to discover what a man patents, but that he should clearly point out in what his claim consists. Two machines which are essentially alike in principle, may differ in a way which would not become the proper subject of a patent. It may, for example, be found necessary to brace a machine more effectually, or to make some part of it stronger than was at first done, and these alterations might constitute real improvements in one sense of the word, although not in another. The patentee should tell us, therefore, whether his improvements extend to the mere fact of arrangement, or include what may be called a new principle, or mode of action, and in what part this new principle, or mode of action, is to be found.

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28. For an improvement in the mode of *Scouring, Smoothing, Burnishing, &c. all kinds of Tanned Skins*, or Leather; Robert Emes, Boston, Massachusetts, November 21.

This machine is intended to perform several operations in the leather manufacture which have hitherto been performed by hand, such as scouring, cleansing, striking out, putting out, smoothing, brushing, dressing, and finishing. The present machine is precisely similar in its general construction to that referred to in the last article, but it is made to carry brushes, sleckers, and substances covered with cloth or felt, adapting it to the performance of the operations above enumerated; these occupy the place of the flint, or other polishers, used in polishing, graining or dicing.

The claim made is not to the brushes, &c. but to the mode of using them by means of the machinery described; the brushes and other instruments attached to the wheel, or revolving arms, being similar to those ordinarily used in the hand.

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29. For an improvement in the *Bedstead* called the "Metamorphoric Alleviator," for which a patent was obtained on the 25th of October, 1830; Jonathan Lowe, Whitesborough, Oneida county, New York, November 21.

The bedstead, it appears, remains essentially the same as under the former patent, but the elevating process, which was originally performed by means of rollers, cords, and pulleys, moved by a crank, is effected, in the improved bedstead, by wheels and axles, using either straps, cords, or chains, or other means of fastening them together, and pinions, ratchets, segments, or other means of changing the position.

All this, it is true, is rather indefinite, but for this we are not answerable, the defect being in the specification.

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30. For a *Chemical Water Proof Cement* for preserving brick and wood work from the injurious effects of water; Charles Fletcher, Boston, Massachusetts, November 22.

The composition here prescribed is a mixture of three quarts of hydraulic cement, two of calcined plaster of Paris, one of unslaked lime, ground; a quarter of a pound of copperas, pulverized; and half a pound of litharge, or red lead. The plaster, we are told, must be calcined in an air tight vessel, and when the above ingredients are mixed together, there must be added half a gallon of boiled linseed oil, the same quantity of spirits of turpentine, and a gill of sour ale or beer. These ingredients are to remain together for two or three days; they are then to be ground, and after being brought to a proper consistence by adding equal parts of boiled oil and turpentine, the work is to be covered with two or three coats of the mixture, laid on by a brush. When a darker shade is wanted, Roman cement is to be added until the desired colour is obtained.

There is no claim made, and, of course, the patent is restricted to the composition exactly as described, a composition which, if it possess the good qualities ascribed to it, may be varied, not only without injury, but probably to advantage.

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31. For a *Thrashing Machine;* Waldren Beach, city of Philadelphia, Pennsylvania, November 23.

A cylinder is to revolve within a curve, and the other parts of this machine strongly resemble such as we have often described; the so called improvements are not of that striking or tangible character as to require particular notice, as they consist mainly in the method of putting the machine together.

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32. For an improvement in *Saw Mills;* Rufus Eaton, Concord, Erie county, New York, November 24.

This machine exhibits a very complex combination of wheels, pinions, and racks, for moving a carriage which supports a circular saw for sawing timber. The improvement particularly claimed is the moving the frame which carries the saw, instead of moving the timber in the usual way.

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33. For a *Cure for Dropsy and Epilepsy;* John S. Fall, Rattlesnake Spring, Morgan county, Georgia, November 25.

The plan of treatment designated in this patent, will, we are told, cure anasarca, ascites, hydrothorax, pericardial dropsy, dropsy of the scrotum, and hydrocephalus internus, producing in adults epileptic affections and mental derangement.

In the first place a tea is to be made by boiling an ounce of Seneca snake root for an hour in a quantity of water, sufficient to make a quart. In this an ounce of saltpetre is to be dissolved; two ounces of this tea is a dose.

A pint of tea is to be made by boiling three drachms of purple foxglove in water. Of this half an ounce is a dose.

After administering aperient medicine, if necessary, a dose of each of the teas is to be given alternately every hour for ten hours in succession, for two or three days; they are then remitted for a day and a half, and resumed, but not continued as long as at first. Pills of one and a half grains of calomel are then to be given morning and night, until slight ptyalism is produced, soon after which the teas are to be resumed, which third course of the teas is generally sufficient for the cure. In case of debility, tonics are to be administered. Should the cure not be completed by the first course, it is to be resumed, and carried to the necessary extent.

We do not know whether the patentee writes M. D.; his specification, however, is drawn up with much more intelligence than those in general which relate to quack medicines, or empirical practice. Whatever of fame or wealth he may acquire by the use of his patent, we doubt, very much, his growing rich by the sale of rights to practising physicians.

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34. For an improvement in *Coach Steps;* George Carter, Newark, Essex county, New Jersey, November 26.

The specification of this patent consists of eighteen words only, communicating the information that the improved coach steps are to be made of malleable cast iron.

Should the validity of this patent be tested in a court of law, the gentlemen of the bar would not, we apprehend, imitate the brevity of the specification; and it might, as has been frequently the case, be found much more easy to claim than to hold a thing. The manufacture of malleable cast iron has, in England, during the last ten or twelve years, embraced the greater number of articles which were formerly made of wrought iron, and, according to the assumption in this, and similar patents, every kind of article so made might have been patented. The *process*, when new, was a proper subject for a patent, but not the individual articles subjected to it.

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35. For a *Machine for Painting Cloth;* Otis Ferrin, Lansingburg, Rensselaer county, New York, November 28.

This machine is in the form of a trough, or hopper, which is to contain the paint. Its bottom consists of a straight piece of timber, covered with leather; one side of the trough, which is called the knife, consists of a board sliding in grooves, and borne down by springs, in order that its lower edge may press upon the cloth as it is drawn through. A roller, on each side of the piece which forms the bottom of the trough, supports the cloth; a stick is attached to the end of the cloth, and to this stick ropes are fastened, leading to a windlass, situated at the distance of the length of the piece; this windlass serving to wind the ropes, and draw the cloth along. The parts claimed are the inclined board, forming one side of the trough, the springs, and the rollers.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for rendering Borings, Filings, &c. of Iron, available in the Furnace. Granted to MAGNADIER MASON, *Georgetown, District of Columbia, November* 8, 1831.

I TAKE the borings, drillings, filings, or turnings, and subject them to the action of a powerful press, or to repeated blows from a tilt hammer, drop press, ram, or to the action of any of the well known machines or instruments by which the particles may be forced together and made to adhere, so as to form lumps partially consolidated. In doing this, every competent workman will be aware that the particles to be acted upon must be confined in a box, or mould, to prevent their being scattered by the pressure, or the blow, to which they are to be subjected. The lumps, or masses, of iron so formed, are placed in a furnace, and treated in the same way in which pig or other iron is treated when it is to be fused, or rendered available.

What I claim as my invention, or discovery, is the bringing the particles of iron which are produced in boring, drilling, filing, or turning, into lumps, or masses, by subjecting them to the action of any machine, or instrument, calculated to effect that object, and thus bringing them into a state from which they can be readily fused, or rendered available, as hereinbefore set forth.

MAGNADIER MASON.

Specification of a patent for Looking Glass Back Grounds to Pictures or other Ornaments. Granted to ISAIAH JENNINGS, *city of New York, November* 11, 1831.

To all whom it may concern, be it known, that I, Isaiah Jennings, of the city of New York, have invented a new and useful mode of forming back grounds to pictures, and ornaments of various kinds, which I call the looking glass ground, and that the following is a full and exact description of my said invention.

The end to be attained is the formation of an aerial back ground to pictures and other ornamental articles, by which they receive an appearance of more perfect relief than by any mode of procedure hitherto known. This I effect in different ways, but all intended to give a looking glass back ground to the picture or ornament. I sometimes take a plate of glass which has not been silvered, and I draw upon it such portrait, picture, ornament, or device, as may be desired, in one or more colours; or I stain or enamel the same upon the glass, and after such picture or device is finished, I proceed to silver the glass, on the same side with the picture or device, in the ordinary way of silvering looking glasses. Or, instead of silvering the glass upon which the picture or device is painted, I place behind it a plate of looking glass, securing the two glasses in any suitable frame, the painting, or device, inwards.

When the picture or device is formed upon paper, or any other material which can be cut out, I carefully cut the said picture or device from its ground, and then lay the ground upon the silvered side of a looking glass, and trace the outline of the picture or device thereon, through the silvering. I then remove the silvering within the said tracing, and apply the picture or device in the space thus formed, securing it by a suitable backboard, or otherwise. Or I place the said picture or device between a plain and silvered glass, which produces the same effect as the foregoing.

At other times I trace the outline, and remove the silvering, as in the last example, and then paint the desired picture or device upon the glass. In either of these modes of procedure a similar effect is produced.

What I claim as my invention is the forming a back ground of looking glass to pictures and ornaments of various kinds, upon the principle, and producing the effect herein described, whether the same be done by either of the modes hereinbefore mentioned, or in any other accomplishing the same object.

ISAIAH JENNINGS.

On the Strength and Best Forms of Cast Iron Beams.

[Continued from p. 271.]

Experiment 11. Beam from model of experiment 9, the top and bottom ribs being altered: the areas of the top and bottom sections as one to four nearly. Strength 3214 lbs. per inch. This result compared with that to be given in experiment 13, for a beam of the common form, shows a gain of one fifth, nearly, in strength.

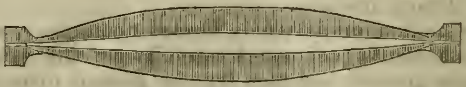
Experiment 12. Bottom flanch increased. Area of section of top and bottom one to five and a half nearly. Strength 3346 lbs., a gain of nearly one-fourth over the common form as given by experiment 13. If the weight of this beam be considered, it reduces the gain over the common form to one-seventh.

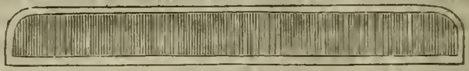
Experiment 13. Beam of the *common form*, cast from the same model as that of experiment 4. Strength 2693 lbs.

The form of the beams experimented upon was now entirely changed.

"The beams in our future experiments were of equal height, through their whole length, and had their top and bottom ribs uniform in thickness, but tapering toward the ends, the bottom rib being parabolic. They are represented by the subjoined vertical plan and elevation, where the sections at the middle of the several beams are as in the following experiments; and the sections, from their middle toward the ends, as in experiments 11, 9, 8.

Plan.





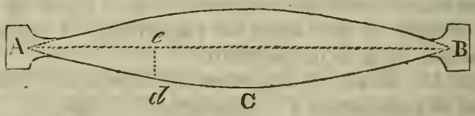
Elevation.

"This form was adopted to save metal, by reducing the bottom rib, which was likely to become very large. The reasonings by which I was led to suggest these deviations from the form of the elliptical beam before used, were the following:

"The vertical part, which was uniform through the whole length,[*] being thin comparatively with the bottom rib, the beam might be made of equal height throughout, and consequently its depth, and power of bearing near the ends, increased with little additional metal.

"From the form of fracture in the preceding experiments, and the great size which the bottom rib would be of, I was convinced that the neutral line in our future experiments would lie very low,[†] and, therefore, nearly all the tensile force would be exerted by the bottom rib, whilst the rest of the beam would serve for little more than a fulcrum; the centre of resistance to compression, or of that fulcrum laying very near to the top, it being perhaps at the point r[‡] in our former experiments.

"Suppose D to be the vertical distance from the centre of compression, at any part of the beam, to the centre of tension in the bottom rib; and T to be the direct tensile strength of the bottom rib at that part; then T multiplied by some function of D, (perhaps $T \times D$) will represent the strength of the beam there. But D, throughout the same beam, will be a constant quantity, or nearly so; the strength of the beam, therefore, at any part, will be nearly in proportion to that of its bottom rib at that part; and as the strain will be less toward the ends, the bottom rib may be reduced there likewise.



"Suppose the bottom rib to be formed of two equal parabolas, the vertex of one of them ACB being at C; then by the nature of the curve, *d e* is as A *e* × B *e;* the strength of the bottom rib, therefore, and consequently that of the beam at that place will be as this rectangle. It is shown, too, by writers on the strength of materials, that the rectangle A *e* × B *e* is the proportion of strength which a beam ought to have, to bear equally the same weight every where, or a weight laid uniformly over it; it would appear, therefore, that the beam above is rightly devised, and these views will be strengthened by the future experiments.

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[*] The vertical part of the beam ought, like the ribs, to have been reduced toward the ends, considering the leverage only; but that was neglected as there might have been too great a tendency in the weight to cut the beam across, near to its ends, if it were more reduced there. See article 53, (page 265.)

[†] This was verified by the 19th experiment, where the wedge showed the neutral line to be at three-fourths of the depth.

[‡] See cuts pages 268, 269, &c.

"The length of the parabola AB in the following experiments, was just four feet six inches, or equal to the distance between the supports, and three inches were added to each end of the beam beyond the points A and B, to lay upon the props; the parabolic bottom was likewise a little strengthened at the ends, as in the figure.

Experiment 14. Distance between the supports 4½ feet, and depth of beam 5⅛ inches. Strength 3246 lbs. Broken by tension, near the middle of the beam.

Experiment 15. Distance between the supports and depth of beam as before. Area of bottom rib increased from 2.314 inches to 2.916 inches. Strength 3194. Beam broken by tension.

Experiment 16. Beam from the same model, but with a larger bottom rib, viz. of 3.413 inches area. Strength less than preceding, from a defect probably in the material, the beam having broken at but little more than half the deflection at which that of experiment 15 gave way.

Experiment 17. Beam of the common form, as in experiment 4. Result not comparable, the same remarks applying as have been made upon experiment 16. Strength about 2466 lbs. per square inch.

Experiment 18. Beam of the same model as that used in experiment 16. Strength 3317 lbs. per square inch.

"43. The preceding beams were intended to be equally strong, in every part, to sustain a load laid uniformly over them; and to see if that was the case in this beam, I made the following experiment: The larger arm of the beam was placed on two supports, two feet three inches apart, and had 26497 lbs. laid upon its middle, without breaking there: it failed at its fractured end, or it would have been tried further.

"Now, from the principle of the lever, (see problem further on,) the strength of half of a beam so broken, is to the strength of the whole beam, as three to two.

"Hence, as the whole beam broke with 19441 lbs. the half should not have broke with less than 29161 lbs. We have no data to prove whether this would or would not have borne that weight, 26497 lbs. only having been laid on it; it is however probable that it would have borne it or a greater weight.

"Another half of a beam of nearly the same dimensions, and which must either have belonged to that in experiment 15 or 16, broke as before in its middle, with 22255 lbs. the breadth of the bottom rib, at the place of fracture, being 4.6 inches.

Now 2 : 3 : : 16905 (expt. 15) : 25357 lbs.
" 2 : 3 : : 14336 (expt. 16) : 21504 lbs.

"Hence, the strength of the end of the beam was a little in defect or excess, according as it belonged to the former or the latter of these experiments.

"The beams in the preceding four experiments, commencing with experiment 14, were cast together, and supposed to have been from the same iron, but the results were so anomalous that nothing could be learned as to the relative strength; there was, however, one fact proved by them, and that a very important one; every beam had broke by tension, or through the weakness of the bottom rib, which though so large had always been torn asunder, while the top part had remained unchanged. It having been prevented from twisting by the small rib there, showed no signs of being over compressed.

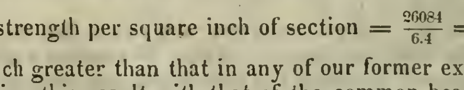
"44. In the following four experiments, and indeed in all the following ones, a good deal of attention was paid to the iron, it was the same as that used in the commencement of this series, and of which a description has been given: it is a strong iron, and was considered by Mr. Lillie as best adapted for beams."

Experiment 19. The last beam having still broken by tension, the bottom rib was again increased, by making it thicker, without altering the depth of the beam. Area of bottom rib 4.4 square inches.

"This beam broke in the middle by compression with 26084 lbs. or 11 tons 13 cwt., a wedge separating from its upper side.

"The weights were laid gradually and slowly on, and the beam had borne within a little of its breaking weight, a considerable time, perhaps half an hour.

"The form of the fracture and wedge is represented by the figure, showing a side view of the beam; where $e\,n\,f$ is the wedge, $e\,f = 5.1$ inches, $t\,n = 3.9$ inches, angle $e\,n\,f$ at vertex = 82°.



"It is extremely probable, from this fracture, that the neutral point was at n, the vertex of the wedge, and therefore at three-fourths of the depth of the beam, since 3.9 inches $= \frac{3}{4} \times 5\frac{1}{8}$ inches nearly.

"Hence strength per square inch of section $= \frac{26084}{6.4} = 4075$ lbs.

which is much greater than that in any of our former experiments.

"Comparing this result with that of the common beam in experiment 22nd, which was cast with these, and which bore 2885 lbs. per inch, we have $4075 - 2885 = 1190$ lbs. = excess.

"$\therefore$ Gain in strength, from the section, $= \frac{1190}{2885} = .41$, or upwards of two-fifths of what was borne by the common beam.

"The quantity of metal saved, through the section, would be represented by the above excess 1190, divided by 4075, the quantity which the beam bore per square inch of section.

" ∴ *Saving of Metal*, from section, $=\frac{1190}{4075}=.292$, or $\frac{3}{10}$ nearly.

"If we compare the strength of this beam, and that in experiment 22, by the weights, as was done in experiments 11 and 12, we shall have the saving in metal, through the section and general form of the beam conjoined, $=.377$.

"As this is the strongest beam we have tried, if it be compared, by weight, with the result from the very strong beam, of the common form, in experiment 7, the saving in metal will be .29.

"45. Thus we have, by constantly making small additions to the bottom rib, arrived at a point where resistance to compression could be no longer sustained; but it was not till the bottom rib had considerably more matter in it than double the rest of the beam, the bottom rib being to the rest as 4.4 to 1.83, and to the top rib as 6 to 1. Still the top rib was not crushed, nor showed any signs of weakness. The fracture took place by the vertical part of the beam becoming torn, by the opposite forces of tension and compression round the neutral line, (see art. 33,*) as was the case in the experiment in article 23.†

"The great strength of this section is an indisputable refutation of that theory, which would make the top and bottom ribs of a cast iron beam equal."

Experiment 20. Same model as that used in experiment 19.
The beam broke in the middle by tension with 23249 lbs.

"This is considerably less than what the former beam bore, through its bottom rib, in which the tensile power of this form of section almost wholly lies, was not much different. The iron must therefore have been weaker.

"Strength per square inch of section $=\frac{23249}{6.5}=3576$ lbs.

"Comparing this with the result of the common beam in experiment 22, which bore 2885 lbs. per inch, $3576-2885=691=$ excess.

" ∴ Gain in strength, from section $=\frac{691}{2885}=.236$, in terms of what the common beam bore; whence saving in metal $=\frac{691}{3576}=\frac{1}{5}$ nearly.

"If we compare this beam with the common one, by their weights, the saving metal will be .26, or upwards of $\frac{1}{4}$th.

"The thickness of the vertical part of the beam, in experiment 19, was .266, and in this experiment .335; we might therefore have increased the bottom rib of this beam, in the ratio of 335 to 266, or $\frac{1}{3}$d nearly, when it is probable the beam would have broke equally soon by tension, or by the rupture of the vertical part as in experiment 19.

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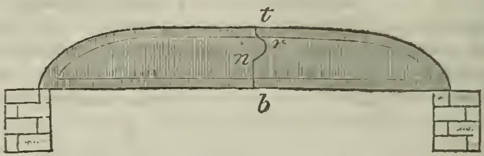
[*] Page 265.

[†] Page 262.

And a much greater excess of strength than that above would have been obtained."

Experiment 21. The beam *elliptical*, being cast from the same model as that in experiment 12, but having the bottom rib increased: broke near the middle by tension with 21009 lbs.

"Form of fracture nearly as $b\,n\,r$ in figure; $bn = 1.8$ inches.



"Hence strength per square inch of cross section $= \frac{21009}{5.41} = 3883$ pounds.

"Comparing this with the result from the common beam in experiment 22, which bore 2885 lbs. per inch $3883 - 2885 = 998 =$ excess.

"Hence gain in strength $= \frac{998}{2885} = .345$, in terms of what the common beam bore: or saving in metal, from section, $= \frac{998}{3883} = .257$, or upwards of $\frac{1}{4}$th.

"If the comparison be made by their weights, the saving in metal will be only .23, which is less than it would have been, had the ends of the beam been formed as in the preceding ones from experiment 13 to this: the bottom rib of this being all of a breadth and thickness, and five feet long; though the distance of the supports was but four feet six inches. This remark applies, though in a less degree, to the beams in expts. 11 and 12, and those immediately preceding them; those beams, like this, having their vertical part an ellipse, and their bottom rib of equal breadth throughout."

Experiment 22. Beam of the common form for comparison. Accident prevented the results from being of authority. The approximate strength is given at 2885 lbs.

The author next proceeds to comment upon the twenty-two experiments already made.

"46. It has been doubtless remarked that, in most of the foregoing experiments, the vertical part of the beam was made much thinner than the bottom rib; which it was necessary for it to be, otherwise that rib must have been proportionably broader, and this would have endangered the strength of it, by its liability to flexure. The injury from irregular cooling in metal of unequal thickness, I was in some degree acquainted with, and it was soon mentioned to me by Mr.

Ewart, whose extensive general knowledge and kindness left few maxims connected with the material uncommunicated. It was felt to be an objection: the appearance of the surface of fracture was minutely examined, but nothing was elicited from it: there was a difference in the aspect of the bottom rib and other parts, but only such as iron of different thickness unconnected would have shown. There was a powerful argument, too, in our favour; we had excellent castings; they had no flaws or defects in them which could be attributed to the cause mentioned above, and their progressively increasing strength left it, I conceive, without doubt, that irregular cooling had no mischievous effect on beams cast like ours. The reason of it may possibly be this, the beam being mostly cast erect, and wrong side up, the heavy bottom rib, lying near the surface in the sand, might nearly keep pace in cooling with the thinner part lower down; and in those cases where the beam was cast on its side, it would cool more regularly with the sand in which it was buried.

"47. In the preceding experiments, it has been mentioned, that we began with that form of section which a highly ingenious modern writer on the strength of cast iron was induced to consider as the strongest to preserve its elasticity, the top and bottom ribs in it being equal; and this form we found to be $\frac{1}{12}$th weaker to resist an ultimate strain, than that of the common beam in the iron on which he wrote, though it would, as we have before seen, be perhaps the strongest in wrought iron. We then, by gradually reducing the top rib in the same model, and adding the part taken off to the bottom one, obtained castings in which the strength was found to be regularly increasing, and the form, in experiment 3d, somewhat stronger than that of the common beam. It did not now seem adviseable to decrease further the top rib; and as every beam had been found to break by tension, or through the weakness of the bottom part, I thought it best to keep increasing the bottom rib by small degrees until the beam broke by the rupture of some other part. This increase was commenced in experiment 9, the ribs in that being as $4\frac{1}{2}$ to 1; and the result, from the form of section, in this case was a gain in strength of about $\frac{1}{7}$th: this beam also broke by tension. Now before increasing the bottom rib any further, I thought it adviseable to add a little to the top one, as the vertical part of the beam, or that part between the ribs would be, perhaps, strong enough for much larger ribs. In expts. 11, 12, and 21, the top rib and vertical part of the model were the same, the only difference being in the breadth of the bottom rib: from the first of these the increase of strength in terms of what was borne by the common beam was $\frac{1}{5}$th, from the second $\frac{1}{4}$th, and from the third $\frac{1}{3}$d; and had we added still more to the bottom rib in the same model, it is probable that the gain might have been much greater.

"48. In experiments 14, 15, 16, 18, 19, and 20, the top rib of the model was the same, but somewhat larger than in experiments 11, 12, and 21, and the bottom rib was the only one varying. In the 19th experiment the section of the bottom rib at the place of fracture was more than double the rest of the section, and the ratio of top and bottom ribs was 1 to 6. In this instance the fracture took place by the rupture of the vertical part of the beam, which happened to be thinner than usual; the gain in strength here, from the section, was upwards of $\frac{2}{5}$ of what the common beam bore; and the saving by it was nearly $\frac{3}{10}$ of the metal. This experiment was repeated in expt. 20, but the beam seems to have been of somewhat weaker iron.

"49. The form of section, in experiment 19, is the best which we have arrived at for the beam to bear an ultimate strain. That in experiment 21, if its bottom rib had been a little further increased, would, it is probable, have borne nearly as much per square inch of section, but its narrower top rib, when tapering towards the ends as in our latter beams, might probably have allowed the beams to have twisted there; a tendency which was observed in an experiment further on. If, then, we adopt the form of beam in experiment 19, I think we may confidently expect to obtain the same strength with a saving of upwards of $\frac{1}{4}$th of the metal; or in other words, that 75 tons of metal will bear more than 100 tons would, if cast in the best models of the usual form.

"50. In the first seven of the preceding experiments those deflections which were obtained were taken in the middle of the beam, but from the mode then used, not with great accuracy. In the succeeding ones a good deal of care was taken, and I imagine they are not very incorrect, though, on account of the smallness of the deflections, inaccuracies could scarcely be avoided; they were not in these taken in the middle of the beam, but three inches from it, as it was more convenient to take them there than in the middle.

"51. If we examine the deflections in experiments 18, 20, and 21, we shall find that in the first and third about two-thirds, and in the second upwards of one-half the breaking weight was laid on without the elasticity being in appearance at all injured. Now this is contrary to former experience, it having been generally found that the elastic force was sensibly injured with about one-third of the breaking weight, (Tredgold's Essay, p. 79.) And as experiments have mostly been made upon rectangular pieces, the above fact, if properly ascertained, will render it probable that change of form may have an influence upon this ratio; and may, in some forms, remove the point of incipient derangement from one-third to one-half, or even two-thirds of the breaking weight.

"52. In the preceding experiments the beams being short, and the deflections small, there was considerable difficulty in ascertaining the precise point where the above defect took place; but the matter seemed to be too important to be allowed to pass without some further investigation, and especially as we should be enabled at the same time to determine what influence a change in the depth of one of our beams would have upon its strength, every other dimension remaining the same. For these purposes, therefore, I made the following experiments.

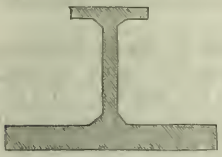
"In these, and indeed in all the future experiments, the same sort of beam was used as that in our last, and which was described immediately before experiment 14; it was broken too in the same manner. There was, however, this slight difference, that there the parabolic base was but just equal in length to the distance between the supports, and the beam had its ends rendered a little wider and longer with matter attached to them to lie on the props; but here the parabola was made six inches longer than the distance between the props, in order that three inches of it might lie upon them at each end; this was done to render the beam capable of bearing more towards the ends, as there was some doubt whether in the preceding experiments the ends were not a little too weak. The beams were all cast seven feet six inches long, and were supported by props seven feet asunder; they were from the same model, which varied only in the breadth of its vertical part, the depth of the beam being all that was intended to vary. The depths were nearly four, five, six, and seven inches; but accurate admeasurements are given with the sections.

“The vertical part in the beams was rendered too strong comparatively with the size of the bottom rib; it was desirable it should be so, that they might all break by tension, or in the same manner, to furnish the means of judging correctly of their relative strength. The bottom rib ought otherwise to have been made stronger, or the vertical part thinner.”

Experiment 23d being the first of a new series, we extract the details.

XXIII. EXPERIMENT.

“Distance between supports seven feet, depth of beam 4.1 inches.



Dimensions of section at place of fracture,
or middle.

Area of top rib = 2.25 × .33 = .74 in.
,, bottom ,, = 6.00 × .74 = 4.44 ,,
Thickness of vertical part = .40 inches.
Area of section = 6.54 inches.

Weight of casting = 1 cwt. 0 qrs. 2 lbs. = 114 lbs.

Weight in lbs.	Deflections in parts of an inch.	Returned to (weights removed.)
2764	.25	0
2879	.25	0
2994	.26	0
3109	.26	0
3224	.27	0 doubtful.
3339	.28	0
3454		perceptible set.
3569	.29	”
3684	.31	.04
3914	.32	.05
4029	.32	.05

"The beam was now removed, and having been again placed under the lever, the experiments were recommenced, and the deflections taken from the form it had assumed.

Weights.	Deflections.	Returned to.
5180	.40	0
5353	.41	0
5525	.44	0
5698	.44	0
6042	.45	0
6215	.51	0
6971	.55	apparent set.
7349	.57	
7727	.62	
8105	.64	
8483	.70	
8861	.74	

"The beam not having been broke at this time, the experiment was resumed two days afterwards, when the beam seemed nearly straight again, and the deflections were those from the form it then had acquired.

Weights.	Deflections.	Returned to.
8637	.75	.03
9327	.76	.03
10017	.80	.03
10707	.88	.03
11397	.95	.04
12087	1.04	.08
12815	1.08	.09

13543 It broke with this within 1½ inches of the middle by tension: 13543 lbs. = 6 tons, 103 lbs.

"53. For a beam to support equally through its whole length a uniform load, it is necessary that it should bear the same weight, when applied towards its ends, that it bore in the middle. To ascertain whether the above beam would have done this, the longer half of it was placed upon two supports three feet six inches asunder; one prop supporting the end as before, and the other lying under the middle of the beam. Weights were then gradually laid on, half way between the supports, till fracture took place. It broke with 23396 lbs. or 10 tons 8¾ cwt., 15 inches from the end, and where the breadth of the bottom rib was 3.85 inches. Now, by the property of the lever, the pressure, which the whole beam bore, is, to the weight which the half beam broken as above, should have borne, as two to three. Hence 2 : 3 : : 13543 lbs.: (weight borne by whole beam:) 20314 lbs. = weight which the half beam should have borne: but it required 23396 lbs. to break it; hence a parabolic beam similar to that above, seven feet six inches long, and broken by props seven feet asunder, is rather too strong toward the ends; and it would have been too strong there still, if the props had been seven feet six inches distant, or at the ends of the parabolic base of the beam.

"54. The other half of the beam was turned the wrong way up, and broken by weights gradually laid on its middle, or half way between the props, one prop supporting the end of the beam as before, and the other placed three feet three inches from it. It broke in the middle with 13356 lbs. or 5 tons 19¼ cwt.

"If we reduce this weight to what it would have been if the distance of the props had been three feet six inches as above, we have three feet six inches: 3 feet 3 inches, or 14 : 13 : : 13356 :12402 lbs. or 5 tons, 10¾ cwt. which is little more than one-half of what the former half beam bore; and the difference of strength would have been much greater, if we had used two equal whole beams. Hence we see the impropriety of turning beams the wrong side up, as is often done in factories. But this matter was still more clearly shown in one of our early experiments (art. 23,) where a T section of cast iron bore nearly four times as much one way up as the other."

Experiment 24. Distance between the supports seven feet, depth of the beam 5.2 inches. Area of top rib .79 sq. inch, of the bottom rib 4.62 sq. inches. Weight of casting 128 lbs. Broke by tension near the middle, with a weight of 15129 lbs. Strength per square inch 2180 lbs. The relative strength of this beam supposing it four feet six inches long, would have been 3391 lbs. per square inch, the material was therefore weaker than that forming the beams of experiments 19, 20 and 21.

Experiment 25. Distance between the supports as before. Depth of beam six inches. Areas of top and bottom rib very nearly as in experiment 23. Weight of casting 127½ lbs. Broke by tension near the middle with 15129 lbs. The author supposes this beam to have been rendered weak by a twist in the vertical part of the casting. The elasticity was nearly destroyed by a weight of 12087 lbs.

Experiment 26. Depth of beam 6.93 inches. Areas of top and bottom ribs nearly as before. Weight of casting 146 lbs. Elasticity nearly destroyed by 13543 lbs. Beam broken by tension exactly in the middle, by a weight of 22185 lbs.

Experiment 27. Depth of beam 6.98 inches. From the same model as the last. Weight of beam 141 lbs. A weight of 19049 lbs. produced a deflection of .58 of an inch.

"With this last weight the beam was conceived to be very near fracture; the weights were therefore removed, and the casting was found to have taken a set of one-tenth of an inch.

"56. To ascertain whether the beam was as strong towards the ends as in the middle to bear a uniform load, weights were now gradually laid upon the beam, at a point half way between the middle and the end, in the same manner as in the note after experiment 24. It bore 20225 lbs. for about half a minute, and then broke near the end, at a place in the under side of the bottom rib, where it was rather unsound. The inference from this experiment, though imperfect, is that the beam would bear a somewhat greater weight near the ends than in the middle.

"57. From these experiments it appears that the ultimate strength in sections like the preceding, is, cæteris paribus, nearly as the depth; but somewhat lower than in that ratio.

"With regard to the elasticity there are some anomalies; experiments 25 and 26 exhibited no defect, when the first beam had borne upwards of two-thirds, and the latter more than one-half the breaking weight. But experiment 23, which was on a beam of very small depth, shows a deviation at an early period, it was, however, very small till upwards of half the breaking weight was laid on; when perhaps the elasticity of the bottom rib began to be injured. The former defect being attributable to some inconsiderable falling off in the elasticity of the compressed part of the beam; possibly arising from oblique compression, through greater flexure in a shallow beam.

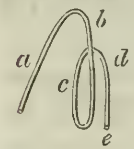
"58. There seems, therefore, to be little doubt that the elastic force is longer perfect in these forms than in those on which experiments have generally been made, and the reason may probably be this: the earlier deflections in our best beams are almost wholly caused by compression, on account of the smallness of the compressed part; and it appears highly probable that cast iron would remain perfectly elastic under much greater forces when applied directly to compress it, than would be required to injure its elasticity by tension."

[TO BE CONTINUED.]

TRANSLATIONS FROM THE FRENCH JOURNALS.*

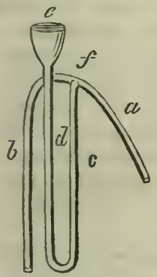
Chemical Instruments.

At the session of the Society for the Encouragement of National Industry, November 29th, M. Collardeau presented two syphons of a new and ingenious construction. They are applicable to cases in which liquids of a corrosive nature, or at a high temperature, are to be transferred from one vessel to another. The first is a common glass syphon of which one of the branches is bent twice so as to return upon itself; (See annexed cut.) One extremity *e* terminates in a capillary tube. The syphon is made to fill itself by placing the finger upon the opening *e* and plunging the branch *a*, up to the curved part, in the liquid. The finger removed, the liquid passes the curved part of the branch *a*, descends through *b*, and rising again flows into the branch *d*, issuing through the opening *e*. When the transfer of the liquid is completed, and the syphon removed, two columns of liquid of equal height remain in the branches *b* and *c*, and to set the syphon again in operation it is only necessary to plunge the branch *a* in the liquid. It is unnecessary to enter into the explanation of the mechanical laws which produce the action just described. We pass rather to a description of the second



* Made at the request of the Committee on Publications.

syphon which will be more generally useful in the arts than the one just described. This is a common syphon, of which the two branches

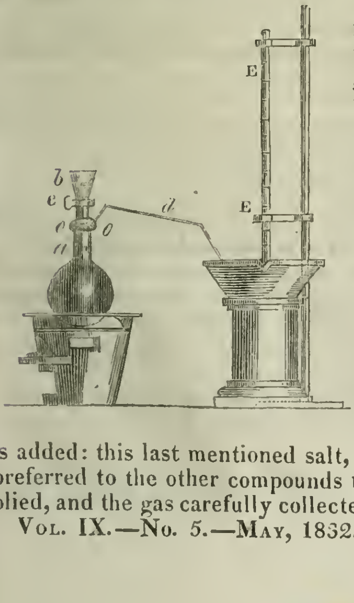


a and *b* are shown in the annexed cut. To this syphon is joined a tube bent into the form of the letter U. One of the branches, *d*, rises higher than the bend of the syphon, and is terminated by a receptacle, *e;* the other branch, *c*, joins the syphon at *f*. To put this syphon in action, a small quantity of the liquid to be transferred is put into the receptacle *e*. This liquid fills the tube *d*, rises into *c*, and passes into the branch *a;* the branch *b* being dipped into the liquid to be decanted it rises in *b*. By pouring more liquid into *e*, causing a flow through *a*, the liquid is drawn into the bend joining *b* and *a*, and the syphon is filled.

[*Bulletin de la Société d'Encouragement, &c.*

New method of testing the Strength of Bleaching Powders.

The important object of a test for the strength of bleaching powders has given rise to many ingenious methods, of more or less easy execution. The following is proposed by MM. Henry, Jr. and A. Plisson. It is founded upon the property which chlorine has, whether free or combined with oxides, of reacting, by the aid of heat, upon certain salts of ammonia, or upon a solution of ammonia in water. The product of this reaction will be nitrogen gas in a proportion to the chlorine which may be calculated by theory.



The apparatus consists of a glass flask of the capacity of about half a pint. Into the neck of the flask a glass funnel *b* is cemented, having a stop cock *c*, and through a second opening in the neck a bent tube *o d* is passed. This serves to conduct the gas disengaged in the flask into a tube E E where the measurement is made. To apply the apparatus, the solution of chlorine, or of the chloride, in a known quantity of water, is placed in the flask, which is then tightly corked and the tube *o d* inserted. Next a solution of some ammoniacal salt, as the sulphate, the carbonate, or bi-phosphate of ammonia is added: this last mentioned salt, or a solution of ammonia, is to be preferred to the other compounds mentioned. Heat is gradually applied, and the gas carefully collected over water which should be rendered slightly alkaline when carbonic acid may be one of the products of the reaction. When the operation is concluded, the flask is filled with water to drive out all the gas. The gaseous product consists of the atmospheric air which the apparatus contained, and of nitrogen from the decomposed ammonia. Knowing beforehand the volume of air which the flask contained after the introduction of the liquids, and subtracting it from the bulk of the gas collected in the receiver, the quantity of nitrogen corresponding to the ammonia decomposed, that is to the chlorine present, is found. This method tried upon liquids of which the composition was exactly known has given very satisfactory results. [*Ibid.*

Note by Translator.—It may not be amiss to state to our readers the theory of the above process. Ammonia is composed of nitrogen and hydrogen, in the ratio of three parts by bulk of hydrogen to one part by bulk of nitrogen. Chlorine unites with hydrogen to form muriatic acid; the chlorine in muriatic acid being to the hydrogen in the ratio of one part by bulk of chlorine, to one part by bulk of hydrogen. If a solution of chlorine react upon a solution of ammonia, for every three parts by bulk of chlorine which unite with hydrogen, one part by bulk of nitrogen gas is liberated. Every part, say cubic inch, of nitrogen which is collected in the process just described, corresponds to three parts, cubic inches, of chlorine in the solution of chlorine or of the chloride: deduction having been made for the atmospheric air introduced from the flask. If we would know the proportion of chlorine by weight in a given weight of the chloride, it is readily found from the ascertained bulk. One hundred cubic inches of chlorine gas when the thermometer is at 60° Fah. and barometer at 30 inches, weigh 76.25 grains. The relative values of different bleaching powders will be given by the relative bulks of nitrogen which they are capable of disengaging from a solution of ammonia. The theory supposes that no reaction takes place between the elements present, other than that just described.

Mirrors of Fusible Alloy.

Berzelius has found that by the union of nineteen parts of lead and twenty-nine of tin, a fusible alloy is produced, which affords, on cooling in thin plates, very bright surfaces. A convex lens dipped several times into the melted alloy, yielded from the surface dipped a concave mirror of great lustre. This, mounted upon plaster, was preserved for some time in the air untarnished. Dust destroys these mirrors, which will not bear wiping.

[*Ibid, or Berzelius, Traité de Chimie, vol. iii.*

¶ *On the Employment of Heated Air in the Smelting of Iron.*[*]

Among the many discoveries that have of late been made in chemical science, there are perhaps few of more practical importance than the ingenious application of heated air in the smelting of iron ore, either in the immediate benefit which it will confer on this important art, or in the various improvements which it is likely to lead to in other operations. The following is a very brief outline of the manner in which the heated air is applied in some of the iron works where this method of working the ore has been introduced.

The air is blown by cylinder bellows in the usual manner, but before entering the smelting furnace it passes through pipes of cast iron heated to redness, which are altogether about thirty feet in length, and three feet in diameter. They are usually made in three or four pieces, joined together by apertures considerably less than three feet in diameter, and placed horizontally, or in whatever manner the local arrangements about the furnace may render most convenient. A brick arch is then thrown round the pipes, leaving a free space of about eight inches and upwards between it and them, and two or more furnaces constructed so as to heat the pipes in the archway, the flues playing into it, and terminating in a common vent at the farther extremity. They may be considered, therefore, as placed on the floor of a long and reverberatory furnace, about six feet high, and nearly of the same breadth, being at the same time protected by fire bricks where they might be injured by the direct flame of the furnaces.

The iron ore is smelted according to this plan with little more than half the coal necessary when the furnaces are worked with air in the usual manner; the small coal which is sold at an inferior price is found quite sufficient for heating the pipes.

It has also been ascertained, that there is no difficulty in smelting the iron ore with common coal instead of coke, and in some furnaces at present in use, no coke whatever is employed, so that it is probable the trouble and expense attending its preparation will be unnecessary. It is likewise in contemplation to endeavour to reduce the iron ore at once in the furnace, without any previous calcination, and the proprietors of some of the iron works seem to entertain little doubt that they will be successful in the attempt.

The great effect produced by the heated air in these furnaces must be attributed to the circumstance that, according to this plan, a higher temperature can be more easily excited and maintained, than when the blast is supplied with air at the ordinary temperature of the atmosphere. And the great saving of fuel we would presume, does not arise from a greater *quantity* of heat being evolved from a given quantity of coke, or coal, in the one case than in the other, but from the greater *intensity* of temperature that prevails when the heated air is employed, insuring the more steady and certain action of the charcoal on the calcined iron-stone, less or none being exhausted without any adequate return, i. e. consumed at an inferior temperature, without affecting the ore in contact with it. It is possible, however, that the absolute quantity of heat evolved may differ according to the temperature at which an inflammable substance is consumed, though no precise experiments have been made to determine this.

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[*] Articles selected by the Committee of Publication will in future be designated by this mark, ¶.

If we consider the quantity of air required for the combustion of common inflammable matter, we shall be better able to appreciate the important effects which must arise from the use of heated air. Let us suppose that coke alone is used in the smelting furnace, and that carbonic oxide is the sole product of the combustion in that part of the furnace where the blast takes effect upon the fuel, then, even according to this calculation, every six parts by weight of charcoal require no less than thirty-six of atmospheric air for their combustion, this quantity containing only eight parts of oxygen. Accordingly, though the air may be so thin and attenuated that we are apt to overlook its cooling influence, every portion of combustible matter mixes with six times its weight of cold air, (air at natural temperatures,) all of which must be heated to a certain extent at the expense of the fuel already in a state of combustion, before it can give out any heat by its action on the inflammable matter of the coal. If, again, carbonic acid be the product of the combustion when the heat is more powerful, twice as much air, (seventy-two parts,) will be necessary for every six of charcoal, or each portion will require twelve times its weight of air. The first effect of the introduction of this large quantity of cold air, must be to diminish the actual temperature of the furnace, however much it may add to it immediately afterwards as it is consumed. If, then, the air be heated before it passes to the furnace, its temperature must be higher than when air is supplied in the usual manner, just in proportion to the degree of heat previously communicated to it.

The high temperature of the furnace not only enables the iron ore to be melted with less fuel than would otherwise be necessary, but by effecting a complete separation of the scoriæ from the melted iron, may contribute also to produce a purer and more perfect pig iron; as it is possible, however, that under these circumstances the iron may receive a larger impregnation of the bases of the earths which are decomposed in small quantity during this operation, the quality of the product demands the most careful examination. The specimens we happened to see, so far as we could judge from bare inspection, appeared excellent.

[*Edinburgh New Philos. Jour. for January*, 1832.

Steam Carriages.

The Committee of the House of Commons, appointed to examine the practicability of employing steam carriages on ordinary roads, having issued their report, we have much pleasure in presenting our readers with an extract of such parts as appear to possess a character of importance, and to throw light upon this interesting subject.

"The committee proceeded in the first instance to inquire how far the science of propelling carriages on common roads, by means of steam or mechanical power, had been carried into practical operation; and whether the result of the experiments already made had been sufficiently favourable to justify their recommending to the house, that protection should be extended to this mode of conveyance, should the tolls imposed on Steam carriages, by local acts of parliament, be found prohibitory or excessive.

"In the progress of their inquiry, they have extended their examination to the following points on which the chief objections to this application of steam have been founded; viz. the insecurity of carriages so propelled, from the chance of explosion of the boiler, and the annoyance caused to travellers, on public roads, by the peculiar noise of the machinery, and by the escape of smoke and waste steam, which were supposed to be inseparable accompaniments.

"It being also in charge to the committee, 'to report upon the proportion of tolls which should be imposed upon steam carriages,' they have examined several proprietors of those already in use, as to the effect produced on the surface of roads by the action of the propelling wheels.

"As this was too important a branch of their inquiry to rest entirely on the evidence of individuals whose personal interest might have biassed their opinions, the committee also examined several very scientific engineers, by whose observations on the causes of the ordinary wear of roads they have been greatly assisted.

"The committee were directed also to report 'on the probable utility which the public might derive from the use of steam carriages.' On this point they have examined a member of the committee, well known for his intelligence and research on subjects connected with the interests of society, and they feel that they cannot fulfil this part of their instructions better than by merely referring the house to the evidence of Colonel Torrens.*

"These inquiries have led the committee to believe that the substitution of inanimate for animal power, in draught on common roads,

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* He says, "I conceive that agriculture is prosperous in proportion as the quantity of produce brought to market exceeds the quantity expended in bringing it there. If steam carriages be employed instead of carriages drawn by horses, it will be because that mode of conveyance is found the cheapest. Cheapening the carriage of the produce of the soil must necessarily diminish the quantity of produce expended in bringing a given quantity to market, and will therefore increase the net surplus, which net surplus constitutes the encouragement to agriculture. For example, if it requires the expenditure of two hundred quarters of corn to raise four hundred, and the expenditure of one hundred more on carriage, to bring the four hundred to market, then the net surplus will be one hundred.

"If, by the substitution of steam carriages, you can bring the same quantity to market, with an expenditure of fifty quarters, then your net surplus is increased from one hundred to one hundred and fifty quarters: and consequently is one of the most important improvements in the means of internal communication ever introduced. Its practicability they consider to have been fully established; its general adoption will take place more or less rapidly, in proportion as the attention of scientific men shall be drawn by public encouragement to further improvement.

either the farmer's profit, or the landlord's rent increased in a corresponding proportion. There are many tracts of land which cannot be cultivated, because the quantity of produce expended in cultivation and in carriage exceeds the quantity which that expenditure would bring to market. But if you diminish the quantity expended in bringing a given quantity to market, then you may obtain a net surplus produced from such inferior soils, and consequently allow cultivation to be extended over tracts which could not otherwise be tilled.

" On the same principle, lowering the expense of carriage, would enable you to apply additional quantities of labour and capital to all the soils already under cultivation. But it is not necessary to go into any illustrative examples to explain this, it being a well known principle, that every improvement which allows us to cultivate land of a quality which could not previously be cultivated, also enables us to cultivate, in a higher manner, lands already under tillage.

"If steam carriages were very suddenly brought into use, and horses thereby displaced, I think the effect stated in the question would be produced for a time; but practically, steam carriages can be introduced only very gradually, and the beneficial effect upon the profits of trade, by bringing agricultural produce more cheaply to market, will tend to increase profits, to encourage industry, and to enlarge the demand for labour; so that, by this gradual process, there will probably be no period during which any land can actually be thrown out of cultivation, the increasing population requiring all the food which horses would cease to consume.

" With respect to the demand for labour, that demand consists of the quantity of food and raw materials which can be cheaply obtained: and as, by the supposition, the displacing of horses will leave at liberty more food and more material, the demand for labour will ultimately be greatly increased instead of being diminished. It has been supposed, I know not how accurately, that there are employed on the common roads in Great Britain, one million of horses, and a horse, it is calculated, consumes the food of eight men. If steam carriages could ultimately be brought to such perfection as entirely to supersede draught horses on the common roads, there would be food and demand for eight millions of persons. But when we take further into consideration, that lowering the expense of carriage would enable us to extend cultivation over soils which cannot now be profitably tilled, and would have the further effect of enabling us to apply, with a profit, additional portions of labour and capital to the soil already under tillage, I think it not unfair to conclude, that were elementary power on the common roads completely to supersede draught horses, the population, wealth, and power of Great Britain, would at least be doubled.

" If there are soils of such a peculiar quality that oats is the only marketable product which they will yield, the persons employed in cultivating those lands would certainly be thrown out of that particular occupation; but the extension of tillage over other lands, not of this peculiar quality, would create a demand for labour, which would much more than absorb the persons thrown out from the culture of oats upon that land which would grow nothing else. But I doubt of there being any land which it is profitable to cultivate, which would not raise some other agricultural produce than oats, either for man or cattle, for which the increasing population would create a demand.

"Upon the case supposed, namely, that steam carriages should be employed in conveying passengers only, and the whole change to be effected in a sudden manner, I think that there would, in the first instance, be a diminished demand for agricultural produce, but the following process would take place. As the demand for agricultural produce was diminished, the price of such produce

"Tolls, to an amount which would utterly prohibit the introduction of steam carriages, have been imposed on some roads; on others, the trustees have adopted modes of apportioning the charge, which would be found, if not absolutely prohibitory, at least to place such carriages in a very unfair position as compared with ordinary coaches.

"Two causes may be assigned for the imposition of such excessive

would fall, food would become cheaper, and the cheapening of food would benefit partly the labouring class, and partly the capitalists, the one obtaining higher real wages, and the other higher profits; this increase in real wages, and in profits, would effect a great encouragement to manufacturing industry, and would necessarily lead to an increase in the manufacturing population, and to the amount of capital employed in manufactures. The consequence would be, that after some degree of pressure upon agriculture, the increased number of human beings would create the same demand for agricultural produce which the employment of horses formerly created.

"So that even upon the extreme and most improbable supposition, that steam carriages should never be employed in conveying agricultural produce to market at a cheaper rate, still the benefit to the country would be very great, inasmuch as we should have a vastly increased industrious population, and England would become, much more extensively than she is at present, the great workshop of the world. In point of fact, superseding horses by mechanical power, would have precisely the same effect in increasing the population and wealth of England, as would be produced were we to increase the extent of the country by adding thereto a new and fertile territory, equal in extent to all the land which now breeds and feeds all the horses employed upon common roads. Such addition to the extent of fertile territory in England, suddenly effected, would, in the first instance, lower the value of agricultural produce, and be injurious to the proprietors of the old portion of the territory, but no person would therefore contend that if we could enlarge the island of Great Britain by additional tracts of fertile land, the public interests would be injured by such enlargement; this would be monstrously absurd. It is not less absurd to object to the increase of food available for human beings, by substituting mechanical power for horses.

"On the principles that have been already stated with respect to agriculture, the cost of bringing all things to market is comprised of the cost of production and the cost of carriage. Reducing the cost of carriage is precisely the same thing in its effects as reducing the immediate costs of production, consequently the conveyance of light goods by steam power, must cheapen all such goods to the consumers. This will necessarily enable them to consume a greater quantity of such goods, and the consumption of the greater quantity will enlarge the demand for labour, call a larger manufacturing population into existence, and thereby re-act on agriculture by increasing the demand for food.

"This cheaper mode of internal carriage will not only lower the price of light and refined manufactures to the home consumer, but will lower their price also to the foreign consumer. This will increase the advantages which we at present possess in the foreign market, and tend to increase our foreign commerce. So that here again there will be an increased demand for manufactures and for a manufacturing population, and here again will be another beneficial re-action upon the soil. So that the more we contemplate the various effects produced upon the industry of the country by a cheaper mode of conveyance, the more we must be convinced that wealth and population will be increased, and that agriculture, instead of being injured, must necessarily partake in the increased prosperity of the country. In addition to what I have already stated, the saving of expense and of time in conveying passengers and goods, and the rapidity of communication, will produce effects, the amount of which it would be almost impossible to calculate."

tolls upon steam carriages. The first, a determination on the part of the trustees, to obstruct, as much as possible, the use of steam as a propelling power; the second, and probably the more frequent, has been a misapprehension of their weight and effect on roads. Either cause appears to the committee a sufficient justification for their recommending to the house that legislative protection should be extended to steam carriages with the least possible delay.

"It appears from the evidence, that the first extensive trial of steam, as an agent in draught on common roads, was that by Mr. Gurney, in 1829, who travelled from London to Bath, and back, in his steam carriage. He states, that although a part of the machinery which brings both the propelling wheels into action, when the full power of the engine is required, was broken at the onset, yet that on his return he performed the last eighty-four miles, from Melksham to Cranford Bridge, in ten hours, including stoppages. Mr. Gurney has given to the committee very full details of the form and power of his engine, which will be found in the evidence.

"When we consider that these trials have been made under the most unfavourable circumstances—at great expense—in total uncertainty—without any of those guides which experience has given to other branches of engineering; that those engaged in making them are persons looking solely to their own interest, and not theorists attempting the perfection of ingenious models; when we find them convinced, after long experience, that they are introducing such a mode of conveyance as shall tempt the public, by its superior advantages, from the use of the admirable lines of coaches which have been generally established; it surely cannot be contended, that the introduction of steam carriages on common roads is, as yet, an uncertain experiment, unworthy of legislative attention.

"The several witnesses have estimated the probable saving of expense to the public, from the substitution of steam power for that of horses, at from one-half to two-thirds.

"Perhaps one of the principal advantages resulting from the use of steam, will be, that it may be employed as cheaply at a quick as at a slow rate; 'this is one of the advantages over horse labour which becomes more and more expensive as the speed is increased. There is every reason to expect that in the end the rate of travelling by steam will be much quicker than the utmost speed of travelling by horses; in short, the safety to travellers will become the limit of speed.' In horse draught the opposite result takes place; 'in all cases horses lose power of draught in a much greater proportion than they gain speed, and hence the work they do becomes more expensive as they go quicker.' On this, and other points referred to in the report, the committee have great pleasure in drawing the attention of the house to the valuable evidence of Mr. Davies Gilbert.*

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* Mr. Gilbert says:—"I have made some further remarks, which I would beg to deliver in also, tending to point out particularly the advantage of steam conveyance when the rate of travelling is great: I would beg to add, that it appears to me extremely difficult to lay down any general rule which would be

"Without increase of cost then, we shall obtain a power which will insure a rapidity of internal communication far beyond the utmost speed of horses in draught; and although the performance of these carriages may not have hitherto attained this point, when once it has been established that at equal speed we can use steam more cheaply in draught than horses, we may fairly anticipate that every day's increased experience in the management of the engines will induce greater skill, greater confidence, and greater speed.

"Nor are the advantages of steam power confined to the greater velocity attained, or to its greater cheapness than horse draught. In the latter, danger is increased in as large a proportion as expense,

applicable to all situations and all roads, inasmuch as they vary with the nature of the materials: that up to a certain weight, proportionate to the corresponding width of the wheel, it is probable that the injury to any road may be very little, but that beyond a certain weight, compared again with a corresponding breadth of the wheels, the materials would be entirely crushed and the road totally destroyed; therefore it follows, that even on all roads there must be a limit to the weight of carriages, as it is quite impossible that a wheel of enormous breadth could bear uniformly on all its surface. For instance, where trains of artillery are drawn over roads, the excess of their weight, beyond what the materials are capable of sustaining, has been found sufficient for grinding them to powder. The slow conveyance of heavy weights may perhaps be affected by steam on well made and nearly level roads, so as to supersede the use of horses; but steam power is eminently useful for producing great velocities. It was last year determined by the Society of Civil Engineers, after much inquiry and discussion, that the expense of conveying carriages drawn by horses was at its minimum when the rate equalled about three miles an hour, and that expense of travelling increased up to the practical limit of speed, nearly as the velocity; including the greater price of horses adapted to swift driving, their increased feed and attendance, the reduced length of their stages, and with every precaution, the short period of their services; on the contrary, friction being a given quantity as well as the force requisite for impelling a given weight up a given ascent, the power required for moving steam carriages on a rail-way remains theoretically independent of its speed, and practically increases but a very little, in consequence of resistances from the atmosphere, slight impacts against the wheels, inertia of the reciprocating piston, &c. The expenditure of what I have termed efficiency, is as the actual force multiplied by the velocity, and the consumption of fuel in a given time will be in the same proportion, but the time of performing a given distance being inversely as the velocity, the expenditure of fuel will theoretically be constant for a given distance, and very nearly so in practice. The power requisite for moving bodies through water is the opposite extreme; here, the mechanical resistance of the fluid increases with the square of the velocity, as do the elevation of the water at the prow and its depression at the stern. The oars, or paddles, must therefore preserve a constant ratio to the velocity of the vessel; and the force applied will consequently vary as the squares of the velocity; and the expenditure of efficiency being as the force multiplied by the velocity, the consumption of fuel will be as the cube of the velocity in a given time, or as the square of the velocity on a given space; and I have ascertained from the records of voyages performed by steam vessels, that the law is nearly correct in practice: hence the great power required for such steam vessels as are constructed not merely for speed, but also to set at defiance the opposition of winds and seas; while, on the contrary, a very small power will be found sufficient for moving ships of the largest dimensions through the water, at the rate of two or three miles an hour, when their sails are rendered useless by continued calms.

by greater speed. In steam power, on the contrary, 'there is no danger of being run away with, and that of being overturned is greatly diminished. It is difficult to control four such horses as can draw a heavy carriage ten miles per hour, in case they are frightened, or choose to run away; and for quick travelling they must be kept in that state of courage, that they are always inclined for running away, particularly down hills, and at sharp turns of the road. In steam, however, there is little corresponding danger, being perfectly controllable, and capable of exerting its power in reverse in going down hills.' Every witness examined has given the fullest and most satisfactory evidence of the perfect control which the conductor has over the movement of the carriage. With the slightest exertion it can be stopped or turned, under circumstances where horses would be totally unmanageable. [*Lond. Jour.*

Remarks on the Explosion of Steam Boilers. Submitted by MR. JACOB PERKINS, *Civil Engineer, to the Select Committee of the House of Commons on Steam Navigation.*[*]

A VAST number of contrivances have been resorted to, to remove the great evil of steam boilers exploding. When the safety valve was invented, it was supposed that this desideratum was accomplished, as nothing theoretically appeared more certain. It was believed that all that then remained wanting was a boiler stronger than the power required to work the steam engine, after which all would be safe, if the safety valve should be kept in order. Time and practice have disappointed these sanguine hopes. That the safety valve cannot be depended on, as a security against explosions, is but too true; in fact, strange as it may appear, the safety valve often hastens the explosion. It has been ascertained beyond all doubt, that explosions frequently follow immediately upon the opening of the safety valve. The cause of this paradox would still have been among the secrets of science, had not a recent discovery pointed out its source, and, I trust, that I shall be excused availing myself of the coinciding testimony of the celebrated Mons. Arago on this part of the subject.

In his publication on the explosion of steam boilers, he thus expresses himself: "How does it happen that a boiler bursts at the very moment of the opening of the safety valve? How does it happen that the accident is almost always preceded by an apparent diminution in the elasticity of the steam? These questions, involving seeming paradoxes, are suggested by the accidents recorded in this paper. Mr. Perkins has, I think, answered them satisfactorily; and I shall lay before the reader the explanation given by that engineer."

I now proceed with the explanation therein adverted to.

In one of my experiments in generating steam, I discovered that the temperature of steam was by no means the true measure of its

[*] See Mech. Mag. vol. xvi. p. 246.

power, although reposing on water, and that steam may be changed instantaneously from low to high steam of the strength of gunpowder, without any addition of heat. It is well known that in proportion to the *density* of steam, so is its power; and it was believed, that as steam increased in temperature, it would also increase in density, if in contact with water. This belief was the source of an important error.

In pursuing my experiments, though explosions frequently took place, they gave me the opportunity of witnessing some facts, never before developed to my knowledge. The first hint which I received was from the melting of the packing (which was of lead,) of the throttle valve. It appeared, by the indicator, that the temperature of the steam at the moment did not exceed four hundred degrees; but the lead which does not fuse under six hundred and fifty degrees, ran from the throttle valve like water, and permitted the steam to escape. The late Dr. Wollaston, who witnessed this new fact, was exceedingly struck with it. He accounted for it by supposing that the throttling of the steam occasioned sufficient friction to increase its temperature, so as to melt the leaden packing. As this was a plausible theory, I gave into it. But shortly after that experiment, I discovered that the steam pipe, leading from the generator to the steam engine, had ignited its non-conducting covering, which was of hempen cord, (to do which required at least eight hundred degrees of heat,) and I then became satisfied that friction was not the cause of the accumulation of heat, since during the last occurrence the steam was not throttled; and then I began to suspect that the steam, although in contact with water, had got *supercharged* with heat. I immediately instituted the following experiments:—

A generator was partially filled with water, and heated to about five hundred degrees, and was consequently exerting a force of about fifty atmospheres, or seven hundred and fifty pounds to the square inch; but the pressure valve being loaded to about sixty atmospheres, or nine hundred pounds to the square inch, it prevented the water from expanding into steam. The receiver, which was destitute both of water and of steam, was heated to about twelve hundred degrees. A small quantity of water was injected into the generator by the forcing pump, which forced out from under the pressure valve into the receiver a corresponding quantity of heated water, and this instantly flashed into steam, which, from its having ignited the hemp cord that covered the steam pipe ten feet from the generator, must have been of at least eight hundred degrees, which would be equal to about eighty atmospheres, or twelve hundred pounds to the inch; but from want of water to give it its necessary density, the indicator showed a pressure of only five atmospheres, or seventy-five pounds per inch. Whether the pressure of the steam which was rushing through the steam pipe was five or one hundred, or more atmospheres, the steam pipe kept up at the high temperature before mentioned, which I attribute to the steam being supercharged with caloric.

The pump was now made to inject a much larger quantity of heated water, and the indicator showed a pressure of from fifty to eighty atmospheres. It soon expanded, (the throttle valve being partly opened,) to the former pressure of about five atmospheres. The water was then injected again and again, and the indicator was observed to oscillate at each stroke of the pump, from five to between forty and one hundred atmospheres, according to the quantity of water injected; clearly showing, that whenever the quantity of water was reduced, there was a great redundancy of heat, with little elastic force, and that the elastic force was suddenly increased by the mere addition of water. It soon occurred to me, that to this might be traced the true cause of the tremendous explosions that suddenly take place *in low as well as high pressure* boilers.

There are many instances where, immediately before one of these terrific explosions had taken place, the engine laboured, showing evidently a decrease of power in the engine. To illustrate this theory of sudden explosions, let us suppose the feed pipe or pump to be choked; in this case, the upper surface of the water would soon sink below some part of the boiler, which ought to be constantly covered by it, thus causing them to become heated to a much higher temperature than the water. The steam now being in contact with the heated metal, readily takes up the heat and becomes supercharged with it. Practical engineers have frequently witnessed the destruction of the packing of pistons by their becoming charred, although the steam issuing from the steam chamber was, in its lowest strata, in contact with the water, the temperature of which did not exceed two hundred and thirty degrees.

It was very evident that this steam was supercharged with heat, and was much above the temperature of the water upon which it was reposing, and in a suitable state to produce explosion, had the water been allowed to rise into and give the steam sufficient density, by any sudden *reduction of pressure* on the water in the lower part of the boiler, by drawing off part of the steam faster than it was generated.

Since caloric will not descend in water, it cannot be taken up by water placed below it. The steam thus supercharged, will heat the upper surface of the boiler in some cases quite red hot, and will ignite coals, or any other combustible matter, which may be in contact with it. This fact I can illustrate by numerous instances on record.

If the water, which is kept below the supercharged steam by the pressure of it, could by any circumstance, be made to take up the excess of caloric in the steam, as well as that from the upper part of the boiler, when heated above the temperature of the water in the boiler, whether the boiler be what is termed a high pressure or a low pressure boiler, the steam therein will instantly become highly elastic, and an explosion cannot be prevented *by any safety valve* hitherto used.

It was stated in evidence, at the coroner's inquest, taken in the Humber, in the case of an explosion on board of the Graham steamboat, that just before the explosion took place, twenty pounds weight was taken off the safety valve. Now, if the steam in that boiler had been properly generated, the relief given to the safety valve could not have produced explosion; but if the water had got low in the boiler, (as was probably the case,) and the steam supercharged with heat, the most ready way to produce explosion was to open the safety valve, thereby allowing the water in the lower part of the boiler to rise suddenly and give density to the steam above it.

Several instances have occurred when there has been sufficient warning, by the rushing of the steam from a rent or fracture, for the bystanders to escape from injury before the explosion took place.

There has been at least one case, where the boiler was raised from its bed into the air by the force of the steam issuing from the rent, (upon the principle of the rocket,) before the water had sufficiently expanded, (by the removal of the steam caused by the rent or fracture,) to take up the heat of the boiler and supercharged steam, when an explosion took place after the boiler had been raised many feet in the atmosphere, and separated with a very great report, one part rising still higher, while the other dashed with great force on the ground.

The full persuasion of my mind is, that such explosions are remedial, by discoveries, which, for the moment, I cannot publicly mention, but which have been confidentially disclosed to an honourable member of this committee.

It is, I believe, a fact, that more persons have been killed by *low* than by *high* pressure boilers in this country, and such has decidedly been the case in America. High-pressure boilers have been substituted in Flintshire within the last twelve months, for those of low pressure, after a destructive explosion of the latter, by which sixteen lives were lost.

JACOB PERKINS.

Harpur Street, September 27, 1831. [*Mech. Mag.*

English Steam Boats.

THE subjoined article we copy from the Albany Daily Advertiser; we have been induced to transfer it to our pages from a conviction of the general correctness and value of the views which it presents. The writer, whoever he may be, is well acquainted with the subject upon which he speaks, and until the reformations suggested by him at the close of the article, or others of a similar character, are adopted, all our schemes for preventing explosions will prove abortive. Such, at all events, is the confirmed judgment of the EDITOR.

The increasing competition on our rivers by the proprietors of steam boats, not only as regards the beauty of their construction and the excellence of their accommodations, but their number and speed, is leading the American public to give the subject of steam their thoughtful consideration. This feeling of interest has been much increased by occasional losses of property, by reason of explosions and defective machinery. It is a singular coincidence, that while our own government was endeavouring to elicit from our men of science, the causes of these accidents, and their proper remedy, that of England was led to make an examination into the causes of the casualties upon the Thames, resulting from the speed of the steam boats on that river, and occurring to the craft which came in contact with them. An investigation took place before a select committee of the house of commons, in September last, and the information elicited is so interesting, that we have taken some pains to present to our readers the most striking features of the examination.

It appears very evident that the English steam boats, even those of the best class, do not move with an average velocity of more than nine miles an hour. That their length is rather under than over one hundred and fifty feet, and their capacity much more frequently between eighty and one hundred and fifty tons than beyond it—their draught of water six feet and upwards.

Until lately their bows were blunt—now they are universally built sharp. Many of their old boats have been lengthened. They carry masts, and their chimnies are sometimes used as such. They consider a vessel not safe after five or six years wear, though some of extraordinary strength are reported to have lasted twelve years. A survey every three years or oftener, is thought necessary. The principal ship builders recommend making the hull nearly solid all the way up, with internal fastenings, trussings and diagonal bracings, the object of which, as avowed by Sir Robert Seppings, was to give "uniform strength from stem to stern." In this opinion the principal ship builders concurred.

As an evidence of the strength of their vessels, the instance of the Ramona was adduced, the Emulous, and Confiance. The former, of three hundred and eighty-five tons, and two engines of fifty horse power, went ashore in a storm at Bologne without injury, at a time when other vessels were sunk. The Emulous went out safely to India, and is now employed in towing vessels on the Ganges, while the Confiance, a government packet, has been out at sea in all weathers, and according to the report of her commander, he has never been obliged to lay to with her. Among other things, he stated that he towed a French corvette in a gale with five hundred troops on board, at the rate of six miles per hour, for five hundred miles distance! It appears that there are forty-two steam boats belonging to the Thames in active service, and eleven that sail out of London to foreign ports. Two passengers per ton, of registered burthen, are considered a fair allowance, although four are oftener carried.

The machinery of these vessels is altogether on the low pressure principle. There is only one high pressure boat known, and that belongs to a French company and plies to Dover.

Generally they have two engines in their boats, not fastened to the timbers at the bottom of the vessels, but usually at the sides. The boilers now getting into fashion are the cylindrical, though the greater part are like those used in our own boats. The average pressure is four pounds per square inch; if it exceeds that much, it is thought very dangerous. Explosions from the boilers are hardly known in England. Their engineers prefer a short to a long stroke of the piston, and small water wheels. They can throw their wheels out of gear at any time, and prefer that method of working their engines when lying to or preparing to start. The Canadian boats are almost all so constructed. A pressure of fifteen pounds is thought to be high pressure. The engines are stopped and started as ours are. The throttle valve appears to be the great dependence of the engineer, and very elaborate experiments were made in a government steamer, to ascertain the relation between the aperture of the valve, and the rates of going in consequence. A boat on the Tay is managed by an index on deck, a small revolving lever, which points to "stop her," "go ahead," "back her," and which any common seaman who can read may manage. Captain Hall says that he was six hours in a boat of this character, manœuvring her in every possible way, during which this hand gear must have been used fifty or sixty times, and yet the engineer never touched the engine. There is an account of this apparatus and a drawing accompanying it, in the Edinburgh Philosophical Transactions.

The English boilers are manufactured chiefly of iron, and are considered to be good for three years only. In the best boats, new ones are always substituted after this period, or the most thorough repairs made to the old at the shops of the maker. They are always placed below deck. In stopping an engine some English engineers think it highly important to regulate the injection cocks as well as the throttle valves; they reckon also, every ton of engine as equal to the power of one horse.

In many steam vessels in the united kingdom, the engine is worked on the deck as in our own.

The general management of the boats is by the captain, mate, steward, pilot, engineer, (first and second,) and a crew of from eight to twenty-five in number, proportioned to the size of the vessel. These vessels are steered by a tiller. Captain Hall has for a long time attempted to introduce the American mode of steering by a wheel. One naval officer who was examined on this point, said it would not do. Another said it would be an excellent improvement: and a pilot swore that steering was principally directed by motions made by hand. At night, however, the lookout gives his warning voice to the pilot. On the St. Lawrence, the noise occasioned by this practice will be readily recollected by American travellers.

The pilot also directs the engineer by his voice, and not by means of a bell, as in our boats.

The boats usually carry a light at the mast head and on each paddle box; and not at the bow, as with us. Captain Hall mentioned the greater brilliancy of American steam boats at night, in consequence of the furnaces being on deck, and the blaze and sparks made by the pine wood which is used for fuel.

A great variety of paddles have been tried in England; among them are the feathered, still in use, Skene's revolving paddle, out of use, and Morgan's, which is in use with some of the government packets. The latter made a difference of almost one-third in favour of the Confiance's speed, lessened the tremor of the boat, and works proportionably faster in a heavy head sea than a calm. The engineer of this vessel describes the bucket as entering the water at an angle of 57½°, and leaving it at 52½°, while the old worked at an angle of 25°. There is said to be no backwater of consequence, and she has towed a boat close to the water wheel without danger.

The London boats are unpopular among the wherrymen, frequently running over and destroying them. This practice appeared to grow out of the carelessness of the wherrymen, and the narrowness of the channel.

The accommodations of these boats are not to be compared to ours.

Upon a review of the subject, we are led to the irresistible conclusion that the English steam boats are not as substantial, nor as fast, nor as comfortable as ours; but they are far safer. On the Hudson river our boats are on the low pressure *plan*, but they carry from sixteen to twenty-five inches of steam, and this is nothing more nor less than high steam. The shape of our boilers is not calculated to resist such a pressure, and some tremendous accident will sooner or later occur to spread ruin and death among the crowds who venture themselves within their reach.

It certainly is possible, now that large boats are becoming so popular, to work steam at a low pressure, and to the greatest advantage; or if high steam must be used, let the cylindrical boilers come again into use.

The competition will inevitably lead to fatal consequences if public opinion does not rectify the errors of our steam navigation.

¶ *On Madder.*

(Ger. *Färberothe*; Du. *Mee;* Fr. *Alizari*, *Garance*; It. *Robbia;* Sp. *Granza*, *Rubia;* Rus. *Mariona*, *Krap;* Hind. *Munjith.*)

MADDER is the roots of a plant, (*Rubia tinctorium*,) of which there are several varieties. They are long and slender, varying from the thickness of a goose-quill to that of the little finger. They are semi-transparent, of a reddish colour, have a strong smell, and a smooth bark. Madder is very extensively used in dying red; and though the colour which it imparts be less bright and beautiful than that of cochineal, it has the advantage of being cheaper and more durable. It is a native of the south of Europe, Asia Minor, and India; but has been long since introduced into and successfully cultivated in Holland, Alsace, Provence, &c. Its cultivation has been attempted in England, but without any beneficial result. Our supplies of madder were, for a lengthened period, almost entirely derived from Holland, (Zealand;) but large quantities are now imported from France and Turkey.

Dutch or Zealand madder is never exported except in a prepared or manufactured state. It is divided by commercial men into four qualities, distinguished by the terms *mull*, *gamene*, *ombro* and *crops.* The roots being dried in stoves, the first species, or mull, consists of a powder formed by pounding the very small roots, and the husk or bark of the larger ones. It is comparatively low priced, and is employed for dying cheap dark colours. A second pounding separates about a third part of the larger roots; and this, being sifted and packed separately, is sold here under the name of gamene, or gemeens. The third and last pounding comprehends the interior, pure, and bright part of the roots, and is sold in Holland under the name of *kor kraps*, but is here simply denominated crops. Sometimes, however, after the mull has been separated, the entire residue is ground, sifted, and packed together under the name of *onberoofde*, or ombro. It consists of about one-third of gamene, and two-thirds of crop. Prepared madder should be kept dry. It attracts the moisture of the atmosphere, and is injured by it.

The Smyrna or Levant madder, (*Rubia peregrina*,) the alizari or lizary of the modern Greeks, is cultivated in Bœotia, along the border of lake Copais, and in the plain of Thebes. It also grows in large quantities at Kurdar near Smyrna, and in Cyprus. The madder of Provence has been raised from seeds carried from the latter in 1761. Turkey madder affords, when properly prepared, a brighter colour than that of Zealand. It is, however, imported in its natural state, or as roots: the natives, by whom it is chiefly produced, not having industry or skill sufficient to prepare it like the Zealanders, by pounding and separating the skins and inferior roots; so that the finer colouring matter of the larger roots being degraded by the presence of that derived from the former, a peculiar process is required to evolve that beautiful Turkey red which is so highly and deservedly esteemed.—(*Thomson's Chemistry; Bancroft on Colours*, vol. ii. pp. 221—278: see also *Beckmann*, *Hist. of Invent.* vol. iii. art. *Madder.*)

In France, madder is prepared nearly in the same manner as in Zealand. The following instructive details as to its cultivation, price, &c. in Provence, were obligingly furnished to us by an English gentleman intimately acquainted with such subjects, who visited Avignon in the autumn of 1829.

"This town, (Avignon,) is the centre of the madder country, the cultivation of which was introduced here about the middle of the eighteenth century, and, with the exception of Alsace, is still confined, (in France,) to this department, (Vaucluse.) The soil appears to be better adapted for its cultivation here than any where else, and it has long been the source of great wealth to the cultivators. Of late years, however, the prices have fluctuated so much, that many proprietors have abandoned, or only occasionally cultivated this root, so that the crop, which was formerly estimated to average 500,000 quintals, is now supposed not to exceed from 300,000 to 400,000.

"The root is called *alizari*, and the powder, (made from it,) *garance*. The plant is raised from seed, and requires three years to come to maturity. It is, however, often pulled in eighteen months without injury to the quality, the quantity only is smaller. A rich soil is necessary for its successful cultivation; and when the soil is impregnated with alkaline matter, the root acquires a red colour—

in other cases it is yellow. The latter is preferred in England from the long habit of using Dutch madder, which is of this colour; but in France the red sells at two francs per quintal higher, being used for the Turkey red dye.

"It is calculated that when wheat sells at 20 fr. per hectolitre, *alizari* should bring 35 fr. per quintal, (poids de table,) to give the same remuneration to the cultivator. That is, wheat 63*s*. per Eng. quarter, and *alizari* 34*s*. per Eng. cwt. The price has, however, been frequently as low as 22 fr. per quintal.

"Prices undergo a revolution every seven or eight years, touching the minimum of 22, and rising as high as 100 fr. As in every similar case, the high price induces extensive cultivation, and this generally produces its full effect four or five years after. The produce of Alsace, which is inferior both in quantity and quality to that of Vaucluse, is generally sold in the Strasburg market.

"England employs both the root and the powder, according to the purpose for which they are intended. The Dutch madder is more employed by the woollen dyers, and the French by the cotton dyers and printers.

"In making purchases of *garance* it is essential to employ a house of confidence, because the quality depends entirely upon the care and honesty of the agent. The *finest* is produced from the roots after being cleaned and stripped of their bark. The *second* by grinding the roots without cleaning. A *third* by mixing the bark of the *first* while grinding; and so on to any degree of adulteration.

"The price of *alizari* in the country, which was only 25 fr. in July, is now, (November,) 1829, at 36 fr. and is expected to be 40 fr. very shortly. The crop being deficient both here and in Holland, and the certainty of its being also deficient next year, added to the small quantity existing in England, give reason to believe that the price will reach 60 fr. before many months, and will continue to advance for a year or two more.

"The *quintals* above mentioned are of 100 lbs. *poids de table*—the weight in general use over the south of France, and even at *Marseilles*. This weight is different in the different provinces, varying from 22 to 25 per cent. lighter than the *poids métrique*. At Avignon 124 lbs. p. de table = 50 kilog., consequently 126 lbs. are equal to 1 cwt. Eng. At the exchange of 25.50, the cwt. costs, (including 11*s*. for freight, duty, and all charges till delivered in London or Liverpool,) 61*s*. or 60*s*. The selling price is quoted in England at 62*s*. only.

It is considered that only one-sixth or one-seventh of the present crop remains for sale.

Madder does not deteriorate by keeping, provided it be kept dry.

Compte simulé.—	Fr.
Cost of one quintal of roots in the country - -	35
Expenses in do. - - - - -	2
	37

The root gives 85 per cent. powder, consequently 1 quintal powder	=	43.50
Grinding	"	2
Cask	"	1
Transport	"	2.50
		F. 46.75
		Fr.
The English cwt. costs, therefore,		58.85
All expenses till on board at Marseilles		3
		F. 61.85

Besides commission.

For an account of East India madder, or munjeet, see munjeet.

The imports of madder have not materially varied for a considerable period. Of 70,017 cwt. of prepared madder imported in 1829, 38,579 were brought from Holland, and 31,352 from France. During the same year the imports of madder root amounted to 33,541 cwt. of which 14,592 were brought from France, 14,007 from Turkey and Greece, 2,376 from Holland, and 2,135, (munjeet,) from India. The exports of Madder from Great Britain are trifling.

The duty on madder is 6*s.* per cwt. on prepared, and 1*s.* 6*d.* per do. on roots; and its price, duty paid, in the London market, October 1831, was as under:—

	£	*s.*	*d.*		£	*s.*	*d.*	
Madder, Duch Crops	4	0	0	to	4	10	0	per cwt.
Ombro	3	5	0	—	3	15	0	—
Gamene	2	3	0	—	3	12	0	—
Mull	1	0	0	—	2	2	0	—
French	0	0	0	—	4	5	0	—
Spanish	2	16	0	—	3	9	0	—
Madder Roots, Turkey	2	10	0	—	2	12	0	—
French	2	8	0	—	2	9	0	—

Madder is not to be imported for home consumption except in British ships, or in ships of the country of which it is the produce, or from which it is imported, under forfeiture of the same, and 100*l.* by the master of the vessel.—(6 *Geo.* 4 c. 109; 7 & 8 *Geo.* 4. c. 56.)

[*Com. Dict.*

Extinction of Fires in Factories.

Sir,—May I desire of you to insert in your valuable periodical two letters which I published in two provincial papers, respecting the extinction of fires in factories, and to which I see you have alluded in one of your late numbers, (page 240, vol. xvi.) I am induced to make this request, with a design of making them more extensively known than they possibly could be through the medium of their original publication, and with the hope that they may lead to some important results. I desire also to correct some errors contained in your brief notice of them in the number to which I have alluded.

Yours, &c.

Jan. 1, 1832. T. Waterhouse.

I. Letter from Mr. Waterhouse to the editor of the Preston Chroncile.

Sir,—Having observed in your Chronicle of last week, an account of the destruction of Messrs. Eccles's factory by fire, I beg permission, through the same medium, to suggest a plan by which similar conflagrations might be in a great measure prevented.

It is well known that steam possesses the power of speedily extinguishing combustion, that it can be generated in factories even during the night in ten minutes or a quarter of an hour, and that it can be diffused through almost any space in a few minutes. Upon these facts my plan is based—it is the following:—Let there be a pipe connected with the steam boiler, larger or smaller, according to the extent of the building. Let this pipe pass up the staircase, and from it, one or two smaller pipes branch off into each room. These branches should extend from one end of the room to the other, and a number of apertures should be drilled into them at certain distances, say two feet asunder. To the branch, or branches, before they enter the room, let a stop cock be fixed, and let the main pipe, as it issues from the boiler, be supplied with another stop cock. When a fire is discovered in an apartment, if in the night time, the person who makes the discovery, instead of wasting a considerable length of time in alarming the neighbourhood, will merely have to go and turn the cock that is affixed to the branch, and the one belonging to the main pipe, and then add a quantity of fuel to the fire to generate the steam. By these means the room may be filled with steam, and the conflagration consequently extinguished in at least twenty minutes. If in the day time, by simply turning the cocks the fire might be subdued in five minutes. This is the whole of the plan, and of its success I have no doubt, unless its simplicity prevent its adoption.

The advantages of this method of extinguishing conflagrations over those which are at present employed, are many and important. When fire engines are employed under the most favourable circumstances, as when they are kept upon the premises, and men at hand to work them, it is often found to be difficult to subdue a considerable conflagration. The stream of water can only be propelled upon a very limited portion of the building at once, and that not always the part where the fire is most active. And should their employment be crowned with success, the buildings must be almost deluged with water. If engines are not on the premises, a very great loss of time may be sustained before they can be procured, as was the case when Messrs. Eccles' factory was consumed, where the engines did not arrive till two hours after the fire was discovered. Engines are often out of repair, and much time is frequently lost in procuring a sufficient number of men to work them. I am aware that in some factories water can be forced through the buildings by the engine in pipes arranged for the purpose. Even according to this plan, the engine must be put in action before the water can be propelled; a large quantity of water must still be ejected to quench the flame; the presence of a person to direct the current of the water is required, and the cold water will condense the heated air in the room, and cause a great influx of air from without, a circumstance which will materially contribute towards maintaining the combustion. By the plan which I have suggested, a boy might extinguish almost any conflagration. The time occupied in putting it in force, would only be ten or fifteen minutes at night, and not more than five minutes in the day time. The presence of no one to direct its operations would be necessary, and it might be made to act on every part of the building at once; the quantity of water expended would not, at the most, exceed a few gallons; and instead of promoting an influx of air into the room, the steam would displace that which was in the apartment previous to its admission; besides, the injury that the machinery would sustain, would be considerably less than is occasioned by the mode at present adopted.

These are advantages such as I trust will induce some of the proprietors of mills to give the scheme their deliberate consideration. I am sanguine enough to believe, that if it were employed, almost a perfect immunity from fire would be possessed, and insurance might be wholly dispensed with. I must apologise for the length of this letter, but I trust you will not deem me presumptuous, when you consider that my object is to point out a method of protecting property, and to prevent the distress incident to the work people from its destruction. These considerations, I hope, will induce you to give these remarks publicity, and prevent you from excluding my communication because of its extension.

I am, sir, your humble servant,

Preston, *Sept.* 27, 1831. T. Waterhouse.

II. Letter from Mr. Waterhouse to the editor of the Lancaster Herald.

Sir,—Having observed in your Herald of last week, a paragraph relative to the extinction of fires in sugar houses, &c., by means of steam, may I be permitted to make known to the readers of your excellent paper the following experiments, which, by the extreme politeness of Mr. William Taylor, of Preston, and with the assistance of some friends, I have been able to make on this interesting and important subject, on a large scale.

"The drying house connected with the moss factory was the place selected for the purpose. It is twenty-six feet long, fifteen wide, and about twelve feet high. In the centre of this room was placed a large iron platform, erected on bricks, to prevent the floor from sustaining any injury from the fire; and a quantity of sheet iron was suspended above, to protect the roof. To a large pipe beneath the floor, a branch, about two yards long, and two inches in diameter, was affixed, furnished with a tap. The main pipe communicated with another issuing from the boiler, which was at a considerable distance. Having closed every aperture through which atmospheric air might have gained ingress, and allowed the steam to flow into the pipes until they were sufficiently warmed, we piled a quantity of shavings and oily cotton waste on the centre of the iron platform, out of the current of the steam—ignited them, turned the tap, and closed the door. The steam being subjected to a pressure of about four pounds on the square inch, rushed into the apartment with considerable velocity, and soon filled it with a dense vapour. We watched the effect produced through a window, and in five minutes we observed the flame to flicker and expire, when the room was in total darkness, it being night. On opening the door, nothing could be perceived, but in a few minutes the smoke and steam subsided, and then a few red embers were discernible. In a few minutes more, the atmosphere in the room became clear, and the embers partially kindled up again. This experiment was repeated two or three times with a similar result, although in one of them pieces of wood were used instead of shavings and cotton waste. In the experiment with the fire of wood, after we had ascertained that the flame was extinguished, we re-closed the door, and allowed it to remain so for fifteen minutes longer. On again opening it, after the expiration of that time, we found that the embers were still burning, but dimly; and on admitting a free access of atmospheric air, were again inflamed. These experiments were tried on the 12th of this month, in the presence of Mr. William Taylor, Mr. Adcock, lecturer on mechanical philosophy, Mr. Elsworth, civil engineer, Mr. Harrison, surgeon, and several practical engineers and spinners. On Thursday the 17th, assisted by Mr. Harrison, I repeated the experiment with a little variation in the same room. We procured a stove grate from Mr. Taylor, kindled a quantity of coke in it, placed it on the platform, out of the direction of the mouth of the branch pipe, and allowed the steam to rush into the room, with a pressure of three and a half pounds to the square inch. We observed that the fire lost much of its intensity, but could not be extinguished. The grate was then removed into the current of the steam, distant from the mouth of the pipe about six feet, when we observed that the coke burnt with great brightness, and a lambent flame issued from the top of the grate. It was obvious that the steam in this experiment was decomposed when it came in contact with the fire, the oxygen meeting with carbonaceous base, and the hydrogen burning on the surface, and uniting with the oxygen of the atmosphere to form water. The coke was then removed from the grate, and its place supplied with shavings and cotton waste. The grate was then placed out of the direction of the steam, the combustibles ignited, the steam allowed to rush into the room, and the door closed. The flame was extinguished in five minutes, as before; but the embers were still smothering, though not sufficient fire remained to rekindle the combustible matter until the grate was brought out of the room into the cold atmosphere. This experiment was several times repeated with the same result. A lantern was then procured and suspended from the ceiling, about two and a half yards above the steam pipe, lighted, and the steam allowed to issue from the pipe while the door was kept open. In a quarter of a minute the light was put out. The back of the lantern was then turned towards the opposite wall, against which the steam was driven, and the recurrent steam was prevented from coming directly against the light by the door of the lantern, so that it could not act upon it till it was generally diffused. In this experiment, the light was extinguished in thirty-five seconds. We had now indubitably proved that flame could be put out by steam in a close apartment in a few minutes, when the conflagration was considerable; and in a few seconds in an open room, when small. And it now remained to ascertain if steam would exert any influence over flame, when a free access of atmospheric air was permitted. This we tried by kindling a fire in the grate of shavings and cotton waste, and placing it out of the current of the steam, while the door was kept wide open. In this experiment the flame expired in four and a half minutes.

Observations.

By these experiments it is proved—

1st. That steam will extinguish a large conflagration in a close apartment in five minutes, when it is driven into the room in considerable quantity.

2nd. That it does not possess the power of preventing a low or charring combustion.

3d. That when a current of steam is impelled against a large fire, it increases the combustion in a remarkable degree.

4th. That a small flame is almost immediately extinguished when suspended in an open apartment into which a considerable volume of steam is rushing.

5th. That steam will subdue flame in an open room as rapidly as in a close one.

From these facts I am disposed to infer, that steam would be of great use in restraining conflagrations in factories or other places where it could be rapidly generated in large volumes; and that it would be of great service, especially in such buildings as are at a considerable distance from engines, or where some length of time must elapse before assistance can be procured, as the watchman could, in fifteen or twenty minutes, diffuse a sufficient quantity to arrest the flame, if pipes were properly arranged for that purpose, according to a plan I laid before the public a few weeks ago in the Preston Chronicle. In all factories in which the conflagrations are very rapid, from the combustibility of the materials they contain, it would be of great use, from the same cause (its easy application,) and would considerably lessen the quantity of water that would afterwards be required to totally quench the burning embers. I fear, sir, that I have already encroached too much upon your columns, but I trust the importance of the subject will be admitted as an apology.

I am, sir, yours respectfully,
T. WATERHOUSE.

Preston, Nov. 19, 1832.

Defence against Flies used by the Butchers of Geneva.

It is said that the butchers of Geneva have for a long time used the oil of laurel as a substance which prevents the flies from approaching their meat. The odour of this oil, though strong, is not very disagreeable, and the flies will not approach the walls or parts which have been rubbed with it. The person who describes these effects says, that he has, in this way, guarded the gilt frames of mirrors and pictures more perfectly from flies. [*Recueil Industriel.*

Meteorological Observations for May, 1832.

Moon.	Days.	Therm.		Barometer.		Dew point	Wind.		Water fallen in rain.	State of the weather, and Remarks.
		Sun rise.	2 P.M.	Sun rise.	2 P.M.		Direction.	Force.		
				Inches	Inches.				Inches.	
⊗	1	44°	61°	29.65	29.62	29	W.	Blustering.		Clear—flying clouds.
	2	36	51	.84	.84	25	W.	Moderate.		Cloudy—clear.
	3	42	56	.53	.40	47	SE. W.	Blustering.	.21	Rain—flying clouds.
	4	33	52	.84	.80	20	W.	do.		Clear day.
	5	35	44	.90	30.00	12	N. NW.	do.		Clear day.
	6	26	42	30.20	.20	11	N. NE.	Moderate.		Clear day.
☽	7	28	50	.10	.00	26	E.	do.		White frost—hazy.
	8	36	49	29.90	29.90	19	N. NW.	do.		Clear day.
	9	36	44	30.15	30.20	10	N. E.	do.		Clear day.
	10	32	52	.20	.10	25	SW.	do.		Cloudy—clear.
	11	38	68	29.90	29.80	40	SW. S.	Breeze.		Cloudy—hazy.
	12	46	72	.80	.80	44	W. S.	Calm.		Hazy day.
	13	46	76	.73	.70	47	W. S.	do.		Clear—hazy.
☺	14	50	79	.60	.60	38	SW. W.	Blustering.		Hazy day—very dry.
	15	45	46	.70	.74	34	SE.	do.		Cloudy day.
	16	36	44	.70	.57	40	E.	do.		Drizzle—drizzle.
	17	44	48	.50	.50	44	NE.	do.		Drizzle—drizzle.
	18	44	47	.60	.70	41	NE.	Moderate.	1.30	Drizzle—cloudy.
	19	42	48	.60	.60	43	N. NE.	do.		Drizzle—cloudy.
	20	42	48	.60	.60	37	N. W.	do.	.05	Drizzle—cloudy.
	21	43	58	.74	.74	33	NW.W.	do.		Clear day.
☾	22	49	60	.83	.83	28	NW.	do.		Clear day.
	23	41	58	30.00	.95	28	E.	do.		Clear—cloudy.
	24	40	54	29.90	.92	37	NW.	do.		Cloudy—clear.
	25	48	62	.90	.00	54	S.	Blustering.		Cloudy day.
	26	50	70	.70	.60	56	SW.	do.		Clear—hazy.
	27	55	70	.60	.70	58	S.	Moderate.	.27	Cloudy—clear—rain.
	28	40	50	.70	.90	36	E. NE.	do.		Cloudy day—rain.
	29	42	49	30.00	30.05	42	S. E.	do.	.10	Drizzle—cloudy.
⊗	30	41	44	.00	.00	42	S. E.	do.	.54	Rain—cloudy.
	Mean	41.00	55.07	29.81	29.81	34.83			2.37	

	Thermometer.	Barometer.
Maximum height during the month,	79. on 14th.	30.20 on 6th, 9th, and 10th.
Minimum do. . .	26. on 6th.	29.40 on 3d.
Mean do. . .	48.03 . .	29.81

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AMERICAN AND OTHER PATENTED INVENTIONS.

JUNE, 1832.

NOTES OF AN OBSERVER.—*On the Expenditure of Mechanical Power.*

If the reader will turn to the number of this journal for March, p. 201, he will find an article extracted from the Register of Arts, containing, as I conceive, a very erroneous method of calculating the power expended in propelling a coach on a turnpike with different velocities.

It appeared, by a series of experiments made by Mr. Macneil, under the superintendence of Mr. Telford, on the London and Liverpool road, in which the force of traction was very accurately ascertained by means of an improved dynamometer, that this force constantly increased with an increasing velocity.

The writer who makes remarks on these experiments comes to the conclusion, that when the velocity is increased from six miles an hour to ten, " there is a saving of nearly one-third of the power expended in conveying a given load the same distance. For although it takes a greater power during the same space of time to draw it at a high than at a low velocity, the gain is in the increase of space passed over by a given power in a given time. No advantage can, however, be taken of this circumstance, with carriages drawn by horses, as horses can exert but little power of draught at high velocities; but in locomotive carriages the case is otherwise," &c.

Now if the power expended is to be calculated by the force of traction multiplied by the *time* in which a particular distance is passed over, the deductions of the writer in question would be correct; but this is not the fact. The force of traction must in all cases be multiplied into the *space* passed over, without regard to the time, when we wish to know the power expended. And where the force of traction is the same at all velocities, as it is on rail-roads, the power expended will be the same in going a given distance whatever the velocity may be.

The writer in question will undoubtedly agree with me that the power expended is in proportion to the quantity of coals used, or which is the same thing, the quantity of steam. Now if he will consider that in running on a rail-road, the force of traction—that is, the density of the steam, is the same at all velocities, he will easily perceive that the quantity of steam used in a given time, will be as the velocity, that is, a double velocity will expend double the quantity of steam, and a triple velocity, a triple quantity, &c. in the same time.

Therefore, *the quantity of steam used is as the space passed over without regard to time.*

If, however, the force of traction increases with the velocity, as in the experiments mentioned above, then the quantity of steam used in passing over a given space will increase with an increased velocity; consequently the power expended, that is, the quantity of steam used, will be greater with high velocities than low, in direct proportion to the force of traction.

I do not know whether any practical man could be led astray by the writer whose error is here corrected, but I thought it ought not to pass without notice.

In conclusion I observe that the views of Mr. Green, who furnished the experiments mentioned above for publication, appear to me to be correct, for he says they are communicated to the editor of the Repertory for the express purpose of correcting the error which almost universally prevails, that it requires less power to work a coach at a high than at a low velocity.

FRANKLIN INSTITUTE.

Explosions of Steam Boilers.

The subjoined communication has been received by the Committee on Explosions since the publication of the series terminating with No. XXVII, in vol. ix. No. 2, of this Journal.

(No. XXVIII.)

Letter from Thomas Ewbank, dated

New York, March 11, 1832.

Gentlemen,—The limited experience which I have in the subject to which your inquiries are directed, induces me to believe that all explosions of steam boilers, may be accounted for by the following causes: 1st. Defects in the construction of the boilers. 2nd. Excessive pressure of steam. 3d. Deficiency in the supply of water. 4th. Neglect. Several of these causes may sometimes combine to produce explosion.

1st. Boilers constructed with interior flues are defective from the nature of the construction, or from the form, situation, &c. of the flues. These, when made of the same material as the boiler, are, from their inferior diameter, almost infinitely stronger than the boiler can be; and ought certainly to be the last parts to give way. From the frequency of their rupture, it is evident that something about them is defective.

It may be said that the action of fire on their interior surface tends to wear them away; but they could only be affected by this cause in the same proportion as the bottom of boilers; this, therefore, does not account for the frequency of ruptures in them. Indeed, if flues are formed of copper and kept clean, with a sufficiency of water always above them, this action of the fire could not, in *many years*, essentially affect them. We see that a common copper tea kettle will last from twenty to fifty years in constant use, although the thickness of the metal, compared with that of a steam boiler, may be but as 1 to 12 or 15. The resistance of steam which flues have to endure, can hardly effect the *wear of the metal*, its tendency being rather to *strengthen* it by compression than otherwise. It has been suggested to discontinue altogether the use of interior flues, and thus cut off one great source of danger. There does not appear any very formidable objection to the adoption of this advice.

The danger arising from flues is considerable, not only on account of their proximity to the surface of the water, so that from a small deficiency, or the lurch of a boat, their upper surfaces become improperly heated, and their strength essentially impaired, but also from the fact of their expansion and contraction being unequal to those of the boiler in which they are placed.

When the *ratio* and *time* of expansion are not the same in both boiler and flues, (and it would be difficult to make them agree in these,) they then have a tendency to injure each other. Large boilers expand unequally, and necessarily so, their lower parts exposed to the fire, being kept at a much higher temperature than the upper parts. They also, from their superior capacity and the quantity of water over the parts exposed to the fire, probably expand more slowly than the flues, (this, however, will perhaps depend considerably on the kind of fuel used,) which latter, from their smaller surface, and the less quantity of water above them, together with the impinging of the flame against their sides in passing through them, are heated more readily. Flues are, besides, placed in that portion of a boiler which expands the least.

It matters not, however, whether the boiler or the flue expand soonest; the effect is the same so long as they do not expand *equally and in the same time.* The *amount* of expansion will of course vary with the material of which they are formed and its thickness. In some experiments which I made upon a wrought iron cylindrical boiler twenty feet long, two feet in diameter, and three-sixteenths of an inch thick, the length increased one line for every forty degrees of temperature: hence I conclude that a twenty feet iron flue, will, in use, undergo an increase in length of from three-quarters of an inch to an inch, and a copper one still more.

If the ends of a boiler to which such a flue is attached, (and it expands more quickly than the boiler,) be made of cast iron, then either those ends must spring as the flue expands, or, the body of the boiler must be strained by the irresistible energy of this power. And should there be a weak or imperfect part in the boiler, it will find it out, and be exerted principally upon it.

When the ends of a boiler are of considerable extent, as those used in boats on the Hudson, and formed of wrought iron or copper, this unequal expansion of flues does little injury, because the ends yield readily to it, without always affecting the *same place* in the metal. But in smaller, or high pressure, boilers, with ends of wrought iron, as those used in the western waters, the effect of the flues is to protrude and draw in alternately those ends, the strain of the metal being almost always in the *same place*, and near their periphery; its action being similar to the bending a piece of metal backwards and forwards until it breaks.

When flues cool sooner than the boiler, the contraction is also exerted on the joints by which they are attached to it, which tends to start and cause them to leak. When parts of either boilers or flues are heated to redness through a deficiency of water, or other cause, their strength is diminished by the consequent expansion, as well as by a loss of tenacity from the heat.

Ruptures of flues are also influenced by the *materials* of which they are formed. When the top of a flue is not covered with water, the intense blast of flame passing through it, is capable of heating it to redness almost instantly, and consequently of destroying essentially its power of resistance. An *iron* flue under such circumstances, if not collapsed by the steam, would *not* have the *texture of the metal materially injured.* But the danger from a *copper* flue when thus heated is imminent, because whenever copper is heated to a bright red, or a little over the melting point of spelter solder, its tenacity is *completely destroyed, nor can it ever be recovered.* It becomes as brittle as spelter, and cannot be bent without breaking. This fact is well known to all coppersmiths; for in brazing, should the copper become "burnt," as it is technically termed, the burnt part must either be cut out, or the whole article thrown aside. The same effect, though in a less degree, is, I believe, caused by frequently heating copper to redness. Hence copper flues are more dangerous than those of iron, when exposed to fire unprotected by water, and new flues offer no more security from this evil than old ones. There was, therefore, no cause for surprise, when the flue of a new copper boiler was rent the first time it was used.

The flue of the "Chief Justice Marshall," I believe, was ruptured from this cause, and the appearance of the metal, (being full of irregular cracks all around the fracture,) indicated this. A diagram, representing the fracture, &c. with remarks, made soon after the accident, having been mislaid, I am unable to attach it to these observations.

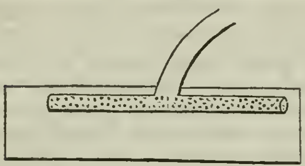
When water once begins to subside below the flue of a steam-boat boiler, the enormous consumption of steam by the engine, rapidly reduces it; and should a supply of water be delayed for a few moments, the parts exposed, if of copper, would, in all probability, become "burnt," when the certainty of an explosion would be almost equal to that of the discharge of a musket, when the trigger is pulled. But if explosion, under such circumstances, did not take place *at that time*, the strength of the flue would be destroyed, the texture of the "burnt" part deranged, and its tenacity or ductility annihilated. To trust to a boiler with such a flue, is to "repose on a volcano." The same observations apply to the parts of copper *boilers* after being so exposed.

So long as the use of flues is continued, their *form* ought invariably to be cylindrical, this being the strongest shape which they can have. They are too frequently made in irregular ovals, merely to accommodate them to their position in boilers, as "kidney flues," &c. When the section of a flue is a circle, the steam, by pressing on it externally, tends to *strengthen* or *thicken* the metal by compression, in direct opposition to its influence on the interior surface of boilers when its tendency is to dilate or make the metal *thinner*. It would appear perfectly impossible for steam of any power to collapse a truly cylindrical flue; unless the strength of a part of it be first diminished or destroyed, as when exposed to fire uncovered by water.

Another defect in flues, as ordinarily used, is in their *situation*, being placed too *high*, or not having a sufficient depth of water over them. Few boilers are designed to have more than from three to six inches of water over the flues, while others have not more than one or two. In the boilers of stationary engines, three or four inches may suffice, if that depth be uniformly preserved; but in steam-boats where the level is constantly liable to considerable change, a greater depth ought certainly to be allowed, so that from six to eight inches of water should be over the flues, under all the ordinary changes of position of the boat. The situation of the boilers themselves, should, in some measure, regulate the depth of water required above the flues. When they are placed on the guards, their flues require more water over them than when placed in midship.

A further reason why flues should have a greater depth of water over them than is usually allowed, is to be found in the *repulsive power of heat*. The upper part of a flue is the hottest part, consequently the repelling power of that part is greater than that of any other; while at the same time, the least quantity of water is over it: thus the least resistance is opposed to this power where its energy is greatest. This repulsion produced by heat may readily be observed by dipping the point of a wire, (a knitting needle for example,) in the tallow of a candle, and collecting as much upon it as will form a drop; by moving the point into the flame, the heat will repel the tallow upwards, although held at an angle of forty-five degrees; and if continued in the flame, it may be brought to a vertical position, and yet the drop be prevented from falling down, which it will instantly do as the wire cools, when withdrawn from the flame. The same principle is shown by Mr. Perkins, in making an aperture in the side of his generator, while at a red heat.*

The effect just explained is probably somewhat increased by the agitation produced within a boiler when steam is admitted to the cylinder. When steam is raised in a boiler, and the engine not working, the water within (if the flues are sufficiently covered,) is probably on a level and nearly at rest; but as soon as steam is admitted into the cylinder, it causes an ebullition of the water, which rises towards the mouth of the steam pipe, in consequence of a portion of the pressure upon it being *suddenly* removed at every stroke of the piston.



This might, I think, be prevented by continuing the steam pipe an inch or two into the boiler, and then branching it off towards each end of it, with small apertures in its sides and ends, as in the diagram.

In this manner, the steam would be equally withdrawn from every part of a boiler, instead of being violently agitated in rushing to one place. Such a tube attached to the aperture of a *safety valve*, would be equally advantageous; or the valve might be placed on one end of the tube leading to the cylinder. This tube might be made of very thin copper, as the pressure on it would be inconsiderable.

Again, a greater depth of the water over flues of steam-boat boilers should be allowed because the ordinary quantity is seldom sufficient to prevent danger after a defect in the means of supply is discovered. The attendant of an engine does not always know the precise moment when the water begins to fall below its proper level; he is only informed of it when he opens the gauge cock. Moreover, gauge cocks are not always certain criterions of the quantity of water in boilers, and even when they are, the supply pump does not always answer the demand of the gauge cocks; a circumstance often unknown to the engineer until the cocks, at some time after the first deficiency is seen, have confirmed a further deficiency, instead of indicating the anticipated supply.

Boilers in steam-boats necessarily partake of the motion of the boats, which renders it difficult to preserve the water at a uniform level; and although a sufficient quantity may be in them when on a level, yet, from their motion, part of the flues will be exposed, unless the supply be sufficient to cover them in the new position.

I would therefore suggest that boilers of boats should be constructed *without internal flues*, as one great preventive of explosions; and that so long as they are used, those boats which have but one or two large boilers, should have at least twelve inches of water over their flues, *when on a level*, the *lowest* gauge cock being that distance above their upper surfaces, and that the form of the flue should be cylindrical.

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* See Franklin Journal vol. iii. p. 413, 421. 1827.

Gauge cocks over *each* flue, would also be advantageous, that when the flue on one side of a boiler is depressed by the lurching of a boat, it may be known whether those on the other side are covered by water or not.

2nd. Excess of steam.—It is obvious that this is one of the principal causes of explosions. Against it no boiler can of itself be secure, however strong its materials and unexceptionable its workmanship. Although it is not always the primary cause of explosions, yet it is almost always the active or direct one. When a deficiency of water is the first cause, an excess of steam is frequently created by the exposed part of either boiler or flues being suddenly brought in contact with the water; the consequent rapid accumulation of steam rends the boiler. The escape of the steam by the safety valve in such cases is out of the question, as it is generally loaded far beyond the proper weight, and the amount of that load perfectly unknown; hence no way of escape is left, unless by the gauge, where it is as effectually stopt, since the column of mercury opposed to it, when pressed into one arm of the gauge, would probably exceed the pressure necessary to rend the boiler. Besides, its capacity for such a purpose would be perfectly insignificant.

The common safety valve, though expressly designed to prevent an excess of steam, is universally admitted to be defective; and yet upon it chiefly depends the safety of the boiler, the boat, and the passengers. The defects of the valve, and of the mode of obtaining the pressure upon it, are still further increased by the *stuffing box* through which the valve rod passes: supposing every other part perfect, what accuracy can be obtained in the amount of pressure on a valve, while this injurious appendage is continued?

But the most obvious defect of the common safety valve is, that it may be loaded indefinitely at the pleasure of the attendants, and this is now so generally done, that it is of little more use than a common cock of the same diameter would be. It is generally opened and closed by a cord attached to it for that purpose, according to the tension of the steam indicated by the gauge; so that instead of being left wholly to the action of the steam, when raised to a certain pressure, its action is made to depend on the attention of the engineer! and he again is guided by the gauge! Under such circumstances we are warranted in asserting that a cock would be a substitute equally effective.

Were it not for the mercurial gauges used in boats, no accurate knowledge of the pressure of steam could be ascertained by safety valves as ordinarily used.

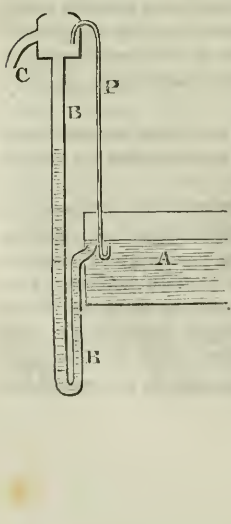
Of the numerous devices for preventing an excess of steam, perhaps none is of more importance than "legislative enactment," to regulate and limit the pressure of steam in boats carrying passengers, according to the material, form and internal diameter of their boilers. The strength of the boilers to be frequently tested, and the force of steam regulated accordingly. There can be no possible security for the lives of passengers in steam-boats, however strong their boilers may be, so long as the elastic force of steam in them can be increased indefinitely, either through temerity, ignorance, intemperance, caprice, or a spirit of rivalry in contests of speed with other boats.

Of mechanical devices, perhaps the most simple and effective is, to balance the pressure by a column of water in a tube placed perpendicularly through the top of a boiler, as is often done in the low pressure boilers of stationary engines. It is one of the surest safeguards from an excess of steam, and also makes known a deficiency of water. Its introduction into steam-boats has been recently recommended by R. V. Dewitt, Esq. of Albany.

The greatest defect in this safety pipe is, that when the steam has overcome the resistance of the column, all the water above the mouth of the pipe in the boiler is blown out; neither can it be replaced until some time after the steam has been permitted to escape, since it would be blown up the tube as fast as injected by the pump. In many situations, boats with such an apparatus, would be nearly in as great jeopardy from the *want* of steam, as from the rupture of their boilers by its *excess*. The mouth of the pipe would be liable to be uncovered at times by the motion of the boat, and the inconvenient height to which the pipe would have to be carried, if applied to boilers containing steam from twenty to twenty-five pounds, is another objection. Notwithstanding, it *has been* applied to steam boats. The "Macdonough," on Lake Champlain, (as I am informed by a gentleman of this city,) had one of these safety pipes put to her boiler in 1828, which has been continued in use to the present time: its height above the boiler is about twenty feet. This boat runs from St. Albans to Plattsburgh.

It would seem difficult to derange this simple apparatus either by negligence or design; yet, in a contest of speed between the Macdonough and another boat, this very pipe was *plugged up* at the top! Several feet were added to its length afterwards.

If used at all in boats, its height ought certainly to exceed every other part by several feet, to prevent the possibility of its being closed in the manner just mentioned.



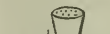
The annexed figure is designed to show how some of its defects may be avoided. A, is part of a boiler. The perpendicular height of the small pipe, P, is to be regulated to the maximum pressure of steam intended to be used. B, B, is the "safety pipe." It is continued down as far as convenient *below* the boiler, before it ascends. When the steam rises above its prescribed force, it will expel the water from P *first*, and so *give notice* to the attendants. Should the warning be neglected, both water and steam would soon be driven out of B, B. C, is to convey the hot water down. The water expelled from P falls into the head of B, B, and again descends into the boiler. It would be difficult to plug the upper end of B, B, if of the form represented in the diagram, as the end of C would also have to be closed, before the steam could be improperly increased. B, B, should be *at least* six feet longer than P.

As a further security against an excess of steam, I have made an addition to the mercurial gauge, by which it will give notice of the excess; and also act (in the proportion of its internal diameter,) as an additional safety valve.

The common gauge is of itself no security against an excess of steam, any further than as it presents to the eye of the attendants an index of its elastic force.

Steam *may* be raised to a dangerous degree without being detected, and very frequently is so: an example is given in the 5th volume of the Journal of the Institute, p. 355. There are not wanting instances where the gauge has been plugged up, like the safety pipe in the "Macdonough" just mentioned.

The common gauge is adapted to the eye only, and it requires a constant examination. With the improvement I have added it addresses itself to the hearing also of all on board. The steam *cannot* exceed its limited pressure without giving instant notice, and it can only be silenced by decreasing that pressure. Its form may be that of the ordinary gauge, but the one I use is similar to that figured.



A, is an iron vessel to contain the mercury: in the centre of its bottom is a tube ten or twelve inches long, cast on it and its lower end closed.

B, is a tube whose length is equivalent to the pressure required.

C, is a tube in which a float acts. D, is the float.

E, the steam pipe.

F, another vessel to receive the mercury when expelled from B.

O, a small pipe to carry off the condensed steam.—(Water remains in F as high as O; it serves to prevent the mercury from being thrown about when forced out of B.)

The action of this gauge cock will be obvious. When mercury is poured into F, it will run down into A. Suppose A is two-thirds full, and steam admitted through E, then the mercury will be pressed up B and C, and if the steam increases above its prescribed force it will be driven out at B, when it again enters A through C.

The pipe C should be ten or twelve inches longer than B.

The action of this gauge is similar to that of the warning pipe described in last page, and which was suggested by the use of this.

Were steam boats provided with gauges of this description, (the length of the pipe B being regulated to the maximum pressure,) any attempt to exceed it would be defeated and made known; and as in the last figure, if the notice thus given, be not attended to, the whole of the mercury would soon be expelled out of A through C.

This gauge also answers every purpose of the common one.

[TO BE CONTINUED.]

Continuation of the Report of the Committee of the Franklin Institute of Pennsylvania, appointed May, 1829, *to ascertain, by experiment, the value of Water as a Moving Power.*

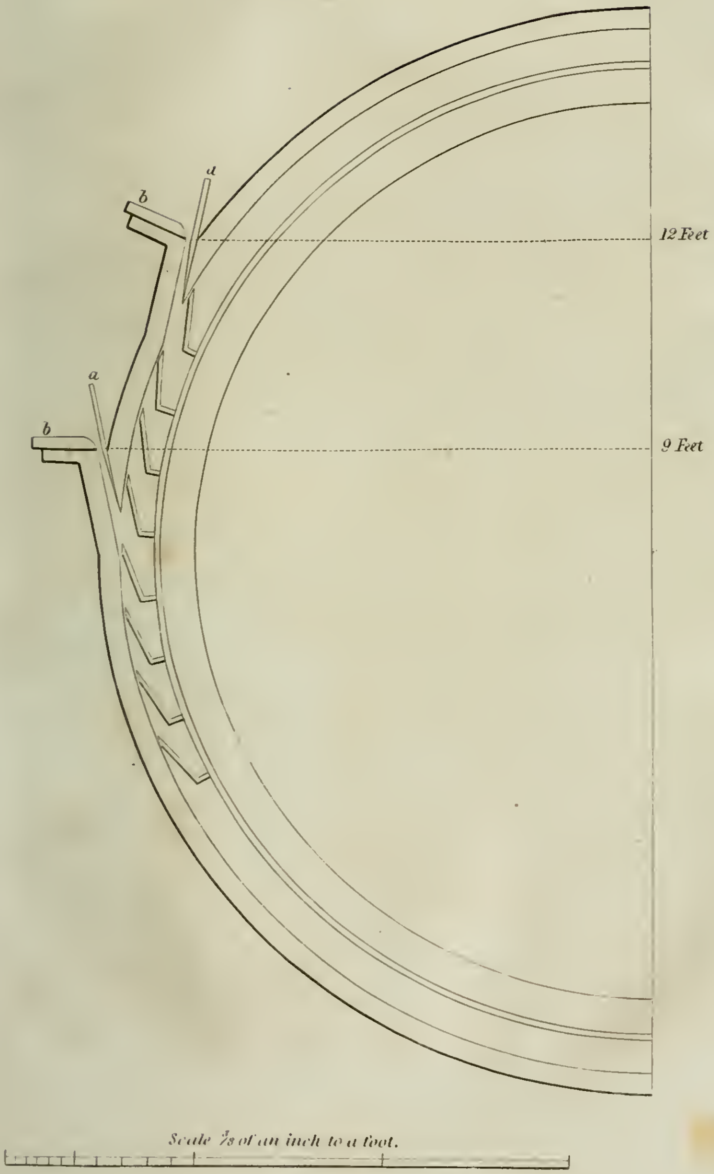
(Continued from p. 303.)

The tables which follow, (viz. e and f,) exhibit the results of a series of experiments made with wheel No. II, to ascertain the different areas of aperture, and quantities of water, required to raise a determinate weight through a given height in a determinate time, with a head and fall of fifteen feet, and of twelve feet, and with intermediate heights of water applied at the same or at different points above the bottom of the wheel. Thus to determine the comparative value of water when employed under the several circumstances embraced in the series.

The two chutes used will be designated as A and B. Each was two inches in width by sixteen inches in breadth, and delivered the water in the same direction with regard to the periphery of the wheel. To each of these chutes was applied the arrangement of gates figured on Plate V. A gate capable of sliding upward is represented at *a*, and at *b* a false gate which could be drawn back until its front edge was even with the back of the chute; beyond this position the gate was prevented from being drawn by a permanent stop. Between the front edge of the gate *b* and the face of *a* the water passed. By moving the gate *b* forward, against *a*, the aperture was closed. The gate *a* was twenty-two inches long, one inch and a fourth thick, and at a line eleven inches from the upper end began to taper, terminating in an edge at the lower end. By lowering or raising this gate the aperture was diminished or increased. In any position in which *a* was placed, the false gate *b* could be moved forward against its face so as to close the aperture. The false gate *b* was two inches thick, the face being rounded so as to leave the smallest part of the opening at its lower edge, at which place the aperture was measured. This line was also taken as that from which to make the division into head and fall: when the gates *a* and *b* were applied at chute A, this line was twelve feet above the bottom of the wheel, and nine feet above the same point when the gates were attached to chute B.

The gates just described having been adapted to chute A, the gate *a* was opened so as to give an area of aperture of fourteen inches; in this position it was secured by screws to prevent the possibility of variation in the aperture by a movement of the gate. The false gate *b* having been also placed, the water in the forebay was raised to the height of three feet above the aperture, making a head and fall of fifteen feet. A series of experiments were then made to ascertain what velocity of the wheel would give a maximum of effect with the assumed area of aperture and head and fall, the weights being varied for this purpose.

The result was, that the maximum effect was obtained with a ve-


a
b
a
b
12 Feet
9 Feet
Scale ⅞ of an inch to a foot.

locity corresponding to 36.75 seconds, and a weight raised of 706 lbs. the height through which the weight was raised being forty feet.

With this weight, aperture, and head and fall, ten experiments were made, the velocity in each being regulated as nearly as possible to correspond to 36.75 seconds; the time in each case being recorded. The head was then changed by three inches at a time until within one and three-fourths feet of the aperture. At each change of head the size of the aperture was adjusted by trial, so as to raise the weight forty feet high in a time as near to 36.75 seconds as was practicable. The proper size of the aperture having been thus found, the gate *a* was secured as before described, and ten experiments made.

The results of the different experiments with chute A are given in table e. To have determined the velocity necessary to produce a maximum effect under each head, would have added very much to the labour of the experiments. The conclusions will show the method by which the knowledge derived from the other experiments can be applied to these cases, in which instead of the precise weight and velocity appropriate to the maximum effect for the head and fall in question, those for a fifteen feet head and fall are used.

To avoid any difference in the form or dimensions of the gates applied to chute B and to A, the gates used at the former were transferred to the latter chute. Experiments similar to those described as made at chute A were then gone through, the heads above the gate being varied from six feet to two by one foot at each series. Table f contains the results of the fifty experiments made at this chute.

TABLE e.—PART I.

WHEEL No. II.—CHUTE A.—*Bottom of gate 12 feet above bottom of wheel.*

No. of Exper't.	Head above gate.	Fall below gate.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	W't of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Observations.
	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.				
1	3.00	12.00	0.66	706	32.18	738.18	40.0	36½	7.76	2930	15.00	439500	295272	.672	
2								36	7.87	2925		438750		.673	
3								36½	7.76	2945		441750		.668	
4								35½	8.00	2935		440250		.671	
5								35½	8.00	2920		438000		.674	
6								36	7.87	2915		437250		.675	
7								37	7.65	2925		438750		.673	
8								37	7.65	2920		438000		.674	
9								37	7.65	2925		438750		.673	
10								37½	7.55	2930		439500		.672	
11	2.75	12.00	1.00	706	32.18	738.18	40.0	37	7.65	2925	14.75	431437	295272	.684	
12								36½	7.76	2915		429962		.687	
13								37	7.65	2925		431437		.684	
14								37	7.65	2930		432175		.683	
15								37	7.65	2925		431437		.684	
16								37	7.65	2945		434387		.680	
17								36½	7.76	2930		432175		.683	
18								37	7.65	2925		431437		.684	
19								36½	7.76	2930		432175		.683	
20								37	7.65	2920		430700		.685	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

TABLE c.—PART II.

WHEEL No. II.—CHUTE A. *Bottom of gate 12 feet above bottom of wheel.*

No. of Exper't.	Head above gate.	Fall below gate.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Observations.
	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.				
21	2.50	12.00	1.07	706	32.18	738.18	40.0	36½	7.76	2945	14.50	427025	295272	.691	
22								36½	7.76	2950		427750		.690	
23								36½	7.76	2960		429200		.687	
24								36½	7.76	2950		427750		.690	
25								36½	7.76	2945		427025		.691	
26								36½	7.76	2930		424850		.695	
27								36½	7.76	2945		427025		.691	
28								37	7.65	2940		426300		.692	
29								37	7.65	2950		427750		.690	
30								36½	7.76	2950		427750		.690	
31	2.25	12.00	1.12	706	32.18	738.18	40.0	36½	7.76	2965	14.25	422512	295272	.698	
32								37	7.65	2970		423225		.697	
33								37	7.65	2950		420375		.702	
34								36½	7.76	2975		423937		.696	
35								37	7.65	2960		421800		.700	
36								37	7.65	2955		421087		.701	
37								37	7.65	2960		421800		.700	
38								37	7.65	2970		423225		.697	
39								36½	7.76	2970		423225		.697	
40								37	7.65	2980		424650		.695	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

TABLE c.—PART III.

WHEEL No. II.—CHUTE A.—*Bottom of Gate 12 feet above bottom of Wheel.*

No. of Exper't.	Head above gate.	Fall below gate.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Observations.
	Feet.	Feet.	In.	Pds.	Pds.	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.				
41	2.00	12.00	1.18	706	32.18	738.18	40.0	36½	7.76	2980	14.00	417200	295272	.707	
42								36½	7.76	3005		420700		.701	
43								37	7.65	2980		417200		.707	
44								37	7.65	3005		420700		.701	
45								36½	7.76	2980		417200		.707	
46								36½	7.76	3000		420000		.703	
47								37	7.65	3015		422100		.699	
48								36	7.87	2995		419300		.704	
49								36½	7.76	3010		421400		.700	
50								36½	7.76	3000		420000		.703	
51	1.75	12.00	1.27	706	32.18	738.18	40.0	36½	7.76	3035	13.75	417312	295272	.707	
52								37	7.65	3040		418000		.706	
53								37	7.65	3035		417312		.707	
54								36½	7.76	3025		415937		.709	
55								37	7.65	3035		417312		.707	* The aperture was next increased to two inches, but the quantity of water delivered was too great for the wheel to receive: the water splashing much, accompanied by the noise usual in such cases. The ratio of effect to power has always been found to diminisb in similar cases, and did so in this.
56								37	7.65	3025		415937		.709	
57								37	7.65	3035		417312		.707	
58								37	7.65	3050		419375		.704	
59								37	7.65	3030		416625		.708	
60								37	7.65	3030		416625	*	.708	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

TABLE f.—PART I.

WHEEL No. II.—CHUTE B.—*Bottom of gate 9 feet above bottom of wheel.*

No. of Exper't.	Head above gate.	Fall below gate.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	W't of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Observations.
	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.				
1	6.00	9.00	0.78	706	32.18	738.18	40.0	37	7.65	3660	15.00	54900	295272	.538	
2								36½	7.76	3675		55125		.535	
3								36½	7.76	3655		54855		.538	
4								36	7.87	3635		54525		.541	
5								37	7.65	3655		54855		.538	
6								36½	7.76	3655		54855		.538	
7								36½	7.76	3620		54300		.543	
8								36½	7.76	3645		54725		.539	
9								37	7.65	3640		54600		.540	
10								37	7.65	3650		54750		.539	
11	5.00	9.00	0.87	706	32.18	738.18	40.0	36¾	7.71	3690	14.00	51660	295272	.571	
12								37	7.65	3700		51800		.570	
13								36½	7.76	3690		51660		.571	
14								36½	7.76	3710		51940		.568	
15								37	7.65	3700		51800		.570	
16								37	7.65	3705		51870		.569	
17								37	7.65	3700		51800		.570	
18								36½	7.76	3685		51590		·572	
19								36¼	7.81	3680		51520		.573	
20								36½	7.76	3690		51660		.571	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

TABLE f.—PART II.

WHEEL No. II.—CHUTE B.—*Bottom of gate 12 feet above bottom of wheel.*

No. of Exper't.	Head above gate.	Fall below gate.	Width of Aperture.	Weight raised.	Friction.	Sum of friction and weight raised.	Height raised.	Time.	Velocity per second.	Wt of water expended.	Head and fall.	Power.	Effect.	Ratio, power being 1.	Observations.
	Feet.	Feet.	In.	Pds.	Pounds	Pounds.	Feet.	Scds.	Feet.	Pds.	Feet.				
21	4.00	9.00	0.97	706	32.18	738.18	40.0	37	7.65	3810	13.00	49530	295272	.596	
22								37	7.65	3790		49270		.599	
23								37	7.65	3800		49400		.597	
24								37	7.65	3800		49400		.597	
25								37	7.65	3800		49400		.597	
26								37	7.65	3755		48815		.605	
27								37	7.65	3800		49400		.597	
28								37	7.65	3805		49465		.596	
29								36½	7.76	3785		49205		.600	
30								37	7.65	3800		49400		.597	
31	3.00	9.00	1.11	706	32.18	738.18	40.0	36½	7.76	3980	12.00	47760	295272	.618	
32								36½	7.76	3975		47700		.619	
33								37	7.65	3975		47700		.619	
34								37	7.65	3960		47520		.621	
35								36½	7.76	3970		47640		.619	
36								37	7.65	3970		47640		.619	
37								37	7.65	3980		47760		.618	
38								37	7.65	3985		47820		.617	
39								37	7.65	3980		47760		.618	
40								37	7.65	3980		47760		.618	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

TABLE f.—PART III.

WHEEL No. II.—CHUTE B.—*Bottom of gate 12 feet above bottom of wheel.*

No. of Exper't.	Head above gate. Feet.	Fall below gate. Feet.	Width of Aperture. In.	Weight raised. Pds.	Friction. Pounds	Sum of friction and weight raised. Pounds.	Height raised. Feet.	Time. Scds.	Velocity per second. Feet.	Wt of water expended. Pds.	Head and fall. Feet.	Power.	Effect.	Ratio, power being 1.	Observations.
41	2.00	9.00	1.5	706	32.18	738.18	40.0	37	7.65	4270	11.00	46970	295272	.628	
42								37	7.65	4280		47080		.627	
43								36	7.87	4265		46915		.629	
44								36½	7.76	4285		47135		.626	
45								37	7.65	4270		46970		.628	
46								36¾	7.71	4300		47300		.624	
47								36½	7.76	4300		47300		.624	
48								37	7.65	4290		47190		.625	
49								37	7.65	4280		47080		.627	
50								36½	7.76	4290		47190		.625	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

BIBLIOGRAPHICAL NOTICES AND REVIEWS.

Practical Essay on the Strength of Cast Iron, and other Metals, &c. &c. by Thomas Tredgold, Civil Engineer, &c. Third edition, improved and enlarged: London, 1831.*

THIS is a posthumous edition of the valuable work of Tredgold on the strength of iron. We are told in the advertisement that the work has been printed from a copy of the second edition, corrected by the author, and that the publication has been superintended by Professor Barlow, of Woolwich. The new edition is essentially the same with the second; the additions, as far as we have been able to detect them by examination, consist of seven notes, of different degrees of importance, by the author, and one by the editor. From the latter note by the editor we learn that the hope expressed by Mr. Tredgold of being able to resume his experiments upon the effect of impulsive force upon iron, had not been realized.

Tredgold presents a fine example of what may be accomplished by persevering industry, even under the disadvantages of want of early education. His works attest the extent of his labours. As given in the advertisement to the work which we have noticed, they are as follow: Elementary Principles of Carpentry, 4to. Treatise on Joinery, (Encyc. Britannica.) Essay on the strength of Cast Iron and other metals, 8vo. Additions to Buchanan's Essays on Mill Work, 2 vols. 8vo. Treatise on Stone Masonry, (Supp. Encyc. Brit.) Principles of Warming and Ventilating Public Buildings, &c. 8vo. Treatise on Rail-roads and Carriages, &c. Letter to Mr. Huskisson on Steam Navigation, 8vo. Additions and Notes to Tracts on Hydraulics, by Smeaton, &c. 8vo. Practical Rules with Diagrams for Barlow's Essay on the Strength of Timber, 8vo. The Steam Engine, comprising an Account of its Invention. Progressive Improvement, &c. 4to.

B.

A Treatise on the Strength and Dimensions of Cast Iron Beams, when exposed to transverse strains from pressure or weight: with a Table of Constants, to be used for calculating the strength and dimensions of similar Beams of Wrought Iron, &c. &c. To which is added the Theory of Bramah's Hydro-Mechanical Press. By William Turnbull. London 1831. 8vo. pp. 86.*

THIS is a *manufactured* work on the strength of materials. The process being as follows. Tredgold's formulæ for the ultimate strength of beams are taken; the constant multipliers from experiment, for the greatest weights borne by the material without impairing the elasticity substituted for the multipliers for ultimate strength, and the formulæ assumed to represent truly the weights which can be borne by different beams without injuring their elasticity. Thus are made out the first fifty-seven pages, entitled "Transverse Strain."

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* COM. PUB.

The next chapter treats of "deflection and stiffness." The first being transcribed from Tredgold, and the second altered from the same author by both subtraction and addition.

The discussion of the theory of Bramah's press, which follows, is wrapped up in equations giving an appearance of difficulty to the calculations relating to it. As a specimen of analysis this theory is not more to be commended, since of the four proportions said to contain the theory, two only are essential, the other two being derivatives. The third, by composition of the first and second, and the fourth by inversion from the second.

The author has placed himself above criticism in his preface, by assuring that he submits his work "to the public eye, indifferent alike to censure or applause—he fears not the one, he courts not the other."

B.

On the Strength and Best Forms of Cast Iron Beams.

[Continued from p. 336.]

Under the patronage of the same liberal proprietors at whose expense the experiments already given were made, our author was enabled to add to the value of his results by a third series, in which the dimensions of the beams were varied considerably: we give the remarks introductory to this third series, with the details of the first experiments.

"The beams were in this instance cast on their side in the manner of those in the first six experiments on beams; it being rather more convenient to cast them so than erect, as has been usually done in the others. The intention of these experiments would perhaps be understood by first taking the three marked 28, 29, 30, and then the next three. I will, however give the following explanation.

"In experiment 28, the model from which the beam was cast was that of experiments 19 and 20, with the bottom rib still further increased; the vertical part of the beam, or that between the flanges, being rendered a little thicker, and tapering upwards from the bottom flange. This was done to endeavour to prevent fracture taking place, by a wedge tearing out from near the neutral line, as was the case in experiment 19.

"In experiment 29, the model of the beam had precisely the same section in its middle as that in experiment 28; but the beam was twice the length. If then the strength be inversely as the length, this beam ought to bear half of that in experiment 28.

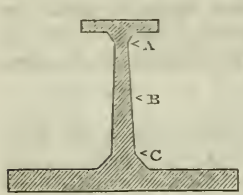
"In experiment 30 the model had in its middle section, the same top and bottom rib, as in the two preceding experiments, with nearly the same thickness of vertical part; but this beam was double the depth of the others; it was likewise double the length of that in expt. 28, and had therefore the same length as that in experiment 29. If then the strength be simply as the depth, as we have before concluded, (article 57,) this beam ought to have double the strength of that in experiment 29; and if the strength with the same section be inversely as the length, its strength should be the same as that in experiment 28, it being double the length and depth, and in other respects the same.

"The remarks above made respecting experiments 28, 29, and 30, will equally apply to experiments 31, 32, and 33, these having been made with the same view, and only differing from the beams in the preceding ones, by having a larger bottom rib.

"60. All the beams, (except those of the common form,) were made like those described after experiment 13; with this difference, however, the parabola of the bottom rib was, in the 4 ft. 6 ins. beams, three inches longer than the distance between the supports, viz. 4 ft. 9 ins., and in the nine feet beams, six inches longer, or nine feet six inches, this was done to render the ends of the beams a little stronger, agreeably to the remarks made prior to experiment 23.

XXVIII. EXPERIMENT.

"Distance between supports 4 feet 6 inches.
Depth of beam, $5\frac{1}{8}$ inches.
Weight of beam, 81 lbs.



Dimensions of section in inches.

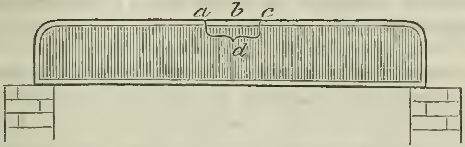
Area of top rib 2.15 × .27 = .58
,, bottom ,, 6.74 × .71 = 4.785
Thickness at A - - .25
,, at B (half way between flanges) .37
,, at C - - .53

Area of section 7.20 inches.

Weight in lbs.	Deflections in parts of an inch.	Returned to, (weights taken off.)
11056	.19	0
11746	.20	0
12436	.23	+
13126	.24	+
13816	.25	.03
14506	.27	.03
15196	.29	.04
15886	.31	
16576	.32	
18592	.36	
19600	.40	
20608	.42	
21616	.45	

22624	.49	.13
23128	.50	
23632	.52	
24136	.53	
24640	.55	

25144 with this it broke. It is doubtful whether by tension or compression, a crack showing a wedge which *broke out afterwards*, and of which *a b c d* is the form.



a c = length of wedge = 4.2 inches.
b d = depth of wedge = 1.7 ,,
25144 lbs. = 11 tons 4½ cwt. = breaking weight.
Hence strength per square inch of section = $\frac{25144}{7.2}$ = 3492 lbs.

"To compare this with the results from the common beam, we will take the mean between those in experiments 4 and 34, they being both supposed to be from the same sort of iron, and the only ones that were cast on their sides. Experiment 4 gave 2584 lbs., and experiment 31, 3009 lbs. per inch: mean = 2796.

$$\therefore 3492 - 2796 = 696 = \text{excess.}$$

"Hence saving in metal, from section, = $\frac{696}{3492} = \frac{1}{5}$ nearly.

"If we compare this beam, by weight, with the mean weights derived from experiments 4 and 34, since in the former 40½ lbs. bore 8270, and in the latter 36½ bore 8792; taking the sums, 77 lbs. bore 17062 lbs.

"∴ 77 : 81 lbs. (the weight of this beam) : : 17062 : 17948 lbs. = weight it should have borne; but it did bear 25144, ∴ 25144 — 17948 = 7196 = excess.

"Hence saving in metal from section and ends = $\frac{7196}{25144}$ = .286.

Experiment 29. Imperfect from defects in the casting.

Experiment 30. Distance between the supports nine feet. Depth of the beam 10¼ inches. Weight 227 lbs. 28672 lbs. broke this beam, by compression, exactly in the middle. A wedge similar to that in experiment 28, but larger, was broken out. The dimensions of the wedge were *ac*, (see figure to experiment 28,) 13 inches, *bd* 5.8 inches.

Experiment 31. Distance between the supports 4½ feet. Depth of beam 5.1 inches. Weight 88 lbs. Area of top rib .52, of bottom 5.472 square inches. Elasticity impaired by 12777 lbs. Broken by tension in the middle by 28168 lbs. Strength 3565 lbs. This presents a saving in metal over the common beam of .215 lbs. derived from the section, and the ends included, of .307, or more than $\frac{3}{10}$ths of the weight of metal.

Experiment 32. Distance between the supports nine feet. Depth of beam $5\frac{1}{8}$ inches. Weight 192 lbs. Intended to compare with the beam of experiment 28. Broken by 15196 lbs., throwing out a wedge as in figure second to experiment 28; $ac = 6.9$ inches, $bd = 2.25$ inches.

Experiment 33. Distance between the supports and depth as in experiment 30. Area of bottom rib increased from 4.72 to 5.70 sq. inches. Elasticity impaired by 19600 lbs. Beam broken by 32200 lbs. A wedge separated.

"61. The beam had twisted a little, by the last two or three weights, in a serpentine manner through its whole length, which shows that in so deep and thin a beam, the top rib (2.2 inches broad in the middle, and tapering to about half that width near the ends,) was as narrow as was admissible to support the beam."

Experiment 34. A *common beam* from the same model as that beam used in experiment 4 but cast upon its side for the sake of comparison. Weight $36\frac{1}{2}$ lbs. Elasticity impaired by 4838 lbs. Strength 3009 lbs. per square inch. This beam, and that of experiment 4, both cast upon the side, give 2796 lbs. as the mean strength of this form thus cast.

Experiment 36. A beam of the *common form* from the same model and iron as in the last experiment, but cast *erect.* Weight 37 lbs. Elasticity impaired by 4493 lbs. Broken by tension, with 9044 lbs. Strength 3188 lbs. per square inch of section.

"62. In the preceding experiments, there ought, according to supposition, (art. 59,) to have been an equality of strength between the beams in experiments 28 and 30, and those in 31 and 33; there was, however, a difference in both cases, of about one-eighth of what the larger beam bore, that beam being the stronger.

"Experiment 29 was defective, but experiment 32, where the object was the same, and which ought to have given a strength equal to half that in experiment 31 or 33, indicated, as it ought, a breaking weight whose double was somewhere between what was given by them. The discrepancies in the strength of the beams in the four experiments first named above, are considerable; but not so great as to render it necessary to seek for any other law. They may, moreover, perhaps, be accounted for by the ways in which the fractures took place; three out of the four beams having broke by the separation of a wedge, and consequently by the rupture of a part whose strength was not so well proportioned as that of the bottom rib, which must have been torn asunder first, if the beams had broke by tension.

"The superior thickness of the vertical part near the bottom rib prevented, as was intended, the fracture taking place as in experiment 19, by the breaking out of a wedge near the neutral line; but it was only that, as in experiment 28, a wedge of a less size, and of the same form, might break out higher up, where the vertical part was thinner. It seems then probable, from these experiments, that no advantage would accrue from making the vertical part of unequal thickness.

Comparing the weights of the beams in experiments 32 and 33, with the loads they bore, we see that a great increase of strength may be obtained through a small additional weight of metal, when the depth can be increased.* This circumstance which was shown too by experiments 23 and 26, will enhance the value of the latter, and of experiments 30 and 33; especially as they are on a larger scale than any other we have made. We have not in these experiments been able to crush the top rib of the beam, though in both 30 and 33, the bottom rib was to the top one in a higher proportion than had been used in experiment 19, or in either of the former series of experiments; the ratio in experiment 33, being nearly that of eight to one. The bottom rib, in both instances, was rather too large for the thickness of the vertical part, as was evident from that part having failed the first. To have made the section then of equal strength every where, and consequently to have disposed the metal in the most economical manner possible, (which has been our principal view in these inquiries,) the vertical part of the beams should have been rendered a little thicker; and, as we have just seen, perhaps, made uniform. The top rib too, small as it was, would in both instances, possibly, have borne a reduction, only that it would have rendered the beam liable to have twisted; a tendency which showed itself in both experiments.

"From these experiments, and those commencing with 23, it is evident that, with a given top and bottom rib and thickness of vertical part, we may often beneficially increase the depth of a beam, and that to a considerable extent; but doubtless, though we have had no experiments suitable to show it, a less thickness of vertical part would have been required, if the depth of the beam were reduced, its length remaining the same. This matter has been touched on in article 33, (see also Robison's Mechanical Philosophy, vol. i. article 390,) and the experiments will throw additional light upon it; but its further consideration must be deferred to some future opportunity.

"These experiments show clearly, too, that in some of our earliest experiments, the weakness of the beams, considering the quantity of section, arose principally from the vertical part being too thick.

"Before concluding these remarks, I may further mention, that in all cases where the beam has broken by the separation of a wedge, as

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"* It is not always adviseable to increase the depth of a beam, when we have the means of doing it, as it would lessen its flexibility, and render it liable to be broken by percussion, through weights falling upon it. Some experiments on the resistance of beams to impulsive forces, which I commenced on a large scale some time ago, through the liberal views of Messrs. Fairbairn and Lillie, may, probably, in an extended form, be offered at some future period to the public.

in the preceding experiments, its vertical part should be rendered a little stronger, so as just to cause it to break by tension, to which case only, the following rules for the strength will properly apply."

We may consider the second part of our author's task completed, and the best form of cast iron beams obtained as the result of his experimental investigation; the successful termination of which he manifestly owes so much to his judicious theoretical views.

The formulæ which he has deduced from his theory apply while the elasticity of the material is perfect, and we are disposed to regret that their results are not placed within the reach of the practical man in so useful a case. The results drawn from the experiments, and having reference to ultimate strength, we proceed to place before the reader. This purpose will be facilitated by collecting the results of the experiments into tables, for the sake of comparison: the plan of the author in stating each experiment separately was pursued in our detail of his labours that his remarks might appear in place.

In the deductions appended to each experiment, comparison was made of the new form with some particular beam of the common form, the early experiments with that of No. 4, which afterwards proved to be deficient in strength compared with other beams of the same form, one of which (No. 34) was cast on its side as well as No. 4. A fairer mode of comparing would be to take *mean* results. That this applies notwithstanding the differences of iron used will appear by comparing the results for different beams cast at different times with those cast at the same time. Proceeding upon this plan, we find for the strength of a beam of the *common form*, cast on its side, 2796 lbs. per square inch.

For a similar beam cast erect (mean of Nos. 10, 13, 17, 22 and 35) we have a strength of 2769 lbs. A result not differing essentially from that just given.

The mean strength of a beam of the *common form* may then be taken at 2782 lbs.

In the table which follows is presented the relative strengths of the different forms of beams experimented upon by the author, the strength 2782 lbs., being taken as unity. Experiments considered by the author to be imperfect are omitted. The series embraces all the experiments made with beams of $5\frac{1}{8}$ inches depth, and $4\frac{1}{2}$ feet bearing length. The first series includes the beams with an elliptical top rib and straight bottom rib, the second those in which the top rib was nearly uniform, and the bottom rib parabolic: these forms were described pages 266 and 326. The modes of casting will be found page 267, and are referred to by the terms there explained.

In order to show the relative *economy* of the different forms of beams, the weight must be considered. The average weight of the two beams of the *common form*, cast on their sides, was 38.5 lbs. Of the five cast erect, 39.5. Average weight of the whole 39 lbs. The value of any form in relation to economy of material, will be in direct proportion to the weight which it will bear, and in the inverse proportion of the weight of the beam. The economy in reference to any other form will be found by taking the compound ratio of their breaking weights divided by the weights of the beams.

The average weight borne by the seven beams of the common form was 8634 lbs. the average weight of the beams 39 lbs.; 8634 divided by 39 or 221.4 will denote the value of this form in an economical point of view. This we shall take as the term of comparison in the table, calling it unity.

As the author's plan consisted in increasing the bottom rib by degrees, and only adding to the top rib when the compression required it, we shall give the ratio of the bottom to the top rib, considering the latter as unity. Thus in the table, experiment No. 3, we find in the fourth line of the second column 4; this would read, the area of the bottom rib to that of the top rib in the proportion of 4 to 1.

No. of exper't.	Ratio of bottom to top rib.	Relative strength per sq. inch.	Measure of economy.	Form and mode of casting.
Mean		1.00	1.00	Common form.
1	1	0.86	0.83	Elliptic top rib. Cast on side.
2	2	0.92	0.85	Do. Do.
3	4	0.98	0.93	Do. Do.
8	4	0.97	0.94	Do. Cast erect, not inverted.
9	4½	1.15	1.09	Do. Cast erect, inverted.
11	4½	1.16	1.15	Do. Do. Do.
12	5½	1.21	1.12	Do. Do. Do.
21	6¾	1.27	1.31	Do. Do. Do.
*14	3¼	1.17		Bottom rib parabolic. Cast erect, inverted.
*15	4¼	1.15		Do. Do. Do.
18	5½	1.19	1.28	Do. Do. Do.
19	6	1.47	1.66	Do. Do. Do.
20	6¾	1.29	1.40	Do. Do. Do.
28	8¼	1.26	1.40	Do. Do. Do.
31	10½	1.28	1.45	Do. Do. Do.

In comparing the relative strengths per square inch in the second column, we see that until the lower rib bore to the upper the proportion of 4 to 1, the beams were deficient in strength when compared with the common form. Arrived at this ratio, the form was nearly the same in strength as the common form; the average of experiments 3 and 8 being 0.975, the excess of strength of 14 may be deemed accidental. The new form has then no advantage until the ratio of the ribs exceeds that of 4 to 1. Experiments 1, 2, 3, 8, and 14 may there-

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* The weights of numbers 14 and 15 are not given.

fore be omitted in considering the cases in which the new form has advantage over the old.

The advantage of the new form increases with the increase of the lower rib, as is seen from 15, 9, 11, 12, 18, 21, 20, 28, 31; considerably in the increase of the rib from 4 to 6¾, and slowly, if at all, above this point. We cannot but regard the excessive strength of 19, (ratio 6 to 1) as accidental, since the strength of 5½ to 1 is given much lower by experiments 12 and 18, and the strength of 6¾ to 1, given by 21 and 20, is also much lower than that given by 19, while those experiments agree well together.

The saving of metal, given by the third column, keeps pace with the increase of strength of the section. The elliptical form of upper rib, with a straight lower rib, shows its inferiority in this point of view to the parabolic form of lower rib by a comparison of experiments 12 and 18, 21 and 20. The judgment of the author in varying his form in the second series is thus clearly shown.

If the remarks which we have made in reference to the results as to the relative strengths of the different forms be correct, the inferences drawn by the author (and which we are about to present) must be received with limitation. When he asserts that the strength of a beam increases nearly in the ratio of the area of a middle section of the lower rib, we must understand that the limits are on one side the ratio of 4 to 1, and on the other that of 6¾ to 1, in the areas of the bottom and top rib, and that the rule is not general for the new form of beam, but only applies to the more advantageous cases. The rule, it will be seen, is proved by experiments within those limits, and our remarks will show that it cannot safely be applied beyond them. These are, however, the cases which it is most important to consider; since, although it might be convenient to have a certain range through which to vary the size of the lower rib, to adapt it to circumstances, it could not be admissible to depart far from the best form.

The following table, in which the areas of the bottom ribs in experiments 9, 11, 12, 19, 20, and 21, as well as the actual strengths, are compared, will serve to render the author's remarks more intelligible.

No. of experiment.	Area of bottom rib in sq. inches.	Ratio of areas of bottom ribs.	Ratio of breaking weights.	Ratio of bottom to top ribs.
9	1.57	1.00	1.00	4½ a 1
11	2.20	1.40	1.35	"
12	2.89	1.84	1.56	5½ a 1
19	4.40	2.80	2.43	6 a 1
20	4.31	2.75	2.17	6¾ a 1
21	3.31	2.11	1.96	6¾ a 1

The following tables present a comparison of the experiments intended to show the relation between the breaking weights and the lengths and depths.

Distance between the supports 7 feet. Ratio of bottom and top ribs 6 to 1 nearly.

No. of experiment.	Depth of beam in inches.	Ratio of depths.	Ratio of breaking weights.
23	4.10	1.00	1.00
24	5.20	1.27	1.12
26	6.93	1.69	1.64

Distance between the supports and breadth both varied. Ratio of bottom to top rib 6 to 1. Experiment 28 taken as unity.

No. of exper't.	Depth of beam in inches.	Length of beam in feet.	Ratio of depths.	Ratio of lengths.	Ratio of depths divided by lengths.	Ratio of breaking weights.
28	$5\frac{1}{8}$	$4\frac{1}{2}$	1.00	1.00	1.00	1.00
30	$10\frac{1}{4}$	9	2.00	2.00	1.00	1.14
31	5.1	$4\frac{1}{2}$	0.99	1.00	1.01	1.12
32	$5\frac{1}{8}$	9	1.00	2.00	0.50	0.60
33	$10\frac{1}{4}$	9	2.00	2.00	1.00	1.28

"65. Comparing the results of experiments 9, 11, 12, 19, 20 and 21,* and allowing for difference of iron, as indicated by the beams of the common form cast with the others for comparison, I find that the strength is nearly in proportion to the size of the bottom rib or flange: a bottom rib of double size giving nearly, but not quite, double strength. And the subsequent experiments show the strength to be as the depth, every thing else being the same.† Therefore in different beams, whose length is the same, the strength must be as their depths multiplied by the areas of a middle section of their bottom ribs: and where the lengths are different, the strengths will be as this product divided by the lengths."‡§

To find a constant multiplier for this product of the area of the bottom rib by the depth, divided by the length, our author compares together the experiments 12, 15, 18, 19, 20, 21, 23, 24, 26, for beams cast erect, and 28, 29, 30, 31, 32, 33, for beams cast on their sides. The multiplier for beams cast erect is nearly 26, the breaking weight being required in tons, and for beams cast on their sides 25.

In accordance with these remarks we give the following rule, applicable to beams of the new form when the ratio of the bottom to the top rib is between the limits already assigned.

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* See table p. 386.

† See first table on this page.

‡ See second table on this page.

§ Let "W = the breaking weight in the middle of the beam, a = the area of a section of the bottom rib in the middle of the beam, d = the depth of the beam there, l = the bearing length, and c a constant quantity, $W = \frac{c\,a\,d}{l}$."

Rule.

Multiply the area of the bottom rib, at the middle of the beam, in inches, by the depth at the same part, also in inches, divide this product by the bearing length in inches.

The quotient thus found, multiplied by 26, will give the weight in tons which will produce fracture if applied at the middle of the beam; the beam having been cast erect.

For a beam cast on its side the quotient found by the first part of the rule, is to be multiplied by 25 to give the breaking weight in tons.

"*Example.*—What weight laid on the middle of one of the main beams, in the rail-road bridge, crossing Water street, Manchester, would be required to break it, supposing it cast erect, and of the same iron we have used; the dimensions from the model now constructing by Messrs. Fairbairn and Lillie being as follow:

"Distance between supports 26 feet, or 312 inches.

"Depth of beam, in middle, $27\frac{1}{2}$ inches.

"Area of section of bottom rib, in middle, $16 \times 3 = 48$ inches.

"Form of section, of beam, nearly the same as in experiment 30."

According to the rule, we multiply the area of the bottom rib in the middle of the beam, 48 inches, by the depth at the same place, $27\frac{1}{2}$ inches, which gives 1320. This product, divided by the bearing length, 312 inches, gives for the quotient 4.23. This quotient multiplied by 26, gives for the weight to produce fracture (109.98, or) 110 tons.

"These beams are intended to bear the same weight in every part; they will not, however, be quite of uniform depth throughout. The load will have to lie upon their bottom rib, through its whole length; it becomes necessary, therefore, to make that rib somewhat broader toward the ends, than according to the parabolic form described after experiment 13; and this enables the depth of the beams, near their ends, to be a little reduced."

The forms determined by our author to be the best, will of course require modification should the weight not be applied in the middle, and the rule must undergo a corresponding change. An example is given by Mr. Hodgkinson of the mode of procedure in such cases. It is that of a beam fastened by one end into a wall, a weight being applied at the other end. Such a beam being only one-fourth as strong as one of equal length to the middle of which a weight is applied to produce fracture, the numbers given by the former rule must be divided by four.

If we would determine the proper form of this beam so that it should be equally strong throughout, we must recur to our rule. By it the weight to produce fracture is proportional to the area of the bottom rib at the middle section, multiplied by the depth, and divided by the bearing length of the beam. If we consider the strength proportional to the weight to be borne, then the area multiplied by the depth, and divided by the length, must be a constant quantity; that is, the product of the area by the breadth must vary with the length; the greater the distance from the point at which the weight is applied, the greater the product of the area by the breadth must be.

If, for convenience, we cast the beam of a constant depth, then the area of the section must be proportional to the distance from the bearing point, that is, the beam must be triangular, the weight being hung to the vertex.

"In like manner, where the weight is to be applied at the middle of the beam only, the stretched rib, then at the bottom, may be uniformly tapered from the middle to the ends, forming two triangles, instead of the parabolas before employed. In this case, the lines C A and C B* and their correspondent ones on the other side, will be straight.

"75. We might now point out other modifications in beams, and particularly in those of steam engines; which, as appears from the experiments, should have a large equal rib or flange at top and bottom, with, perhaps, a thin solid sheet between them; differing, in the size of the ribs, only, from the form in figure 26, plate 4th of Tredgold's Essay on the Strength of Cast Iron. This is for double engines, but for single ones the beam should have a large rib at top, and a small one at bottom, and be formed like that in the conclusion of the last article. But the further consideration of this matter would extend too far the limits of this paper; it would be well, however, if it were subjected to experiment, as that might tend to a reduction in the mass, and inertia, of these beams."

We have yet one subject through which to follow the author, namely, that of ultimate deflection.

[TO BE CONTINUED.]

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN DECEMBER, 1831.

With Remarks and Exemplifications, by the Editor.

1. For a *Machine for Gathering and Cleansing Fruit*, called the "apple machine;" Elias Ellis, Duxbury, Washington county, Vermont, December 5.

This machine consists of a trough, or spout, which is made in two lengths for the convenience of removal. It is to be placed upon trussels so as to form an inclined plane. The apples are to be drawn by a wooden hoe into a tray placed upon the ground; from this, they are to be poured on to the upper end of the spout, down which the sound ones are to run, leaving the dirt, leaves, grass, and unsound apples behind. This is the whole affair.

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* See figure p. 326.

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2. For *Axletrees, Hubs, and Spokes for Carriages;* Garner Wilkinson, White Creek, Washington county, New York, December 6.

The main object of this patent appears to be the fixing of the axle firmly in the nave or hub of the wheel, with a cylindrical gudgeon, or shaft, projecting out, which is to revolve in metal boxes fixed in that part of the axletree which is attached to the carriage. The apparatus, we are told, may be made of wood, or metal, and the mode of putting it together, in either case, is described; there, however, is no claim made, and as the principal feature is without novelty, we are unable, without further advice, to tell for what the patent is taken.

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3. For a *New mode of Manufacturing Tobacco;* John Allen, jr. and Charles Geoghegan, Richmond, Virginia, aliens, who have resided two years in the United States, December 6.

This improvement in the mode of manufacturing tobacco, will, it is said, save from fifty to seventy per cent. of the labour required by the old mode of making, by hand, plug and twisted tobacco, for chewing.

The lighter kinds of chewing tobacco in which the lumps vary from sixty-four to thirty-two pieces to the pound, are to be spun in the usual way, and then wound upon boards, which may be of such size as will suit the press, say four feet by three. It is then to be pressed flat, and by means of a circular, or a straight, knife, divided into lengths whilst upon the board, and thus prepared of the desired weight and length for packing

The heavier kinds, such as average from six to eighteen to the pound, are to be made into rolls of from six to thirty-six inches in length, which are then to be placed upon the board, pressed, and afterwards divided by the knife.

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4. For an improvement in the *Concave Bed of the Thrashing Machine;* Isaac S. Palmer, city of Philadelphia, December 6.

The cylinder of this machine does not differ from some others; the patent, as the title indicates, being taken for the manner of constructing the concave only. This part is thus described.

"Beneath the cylinder is suspended, on springs, a relief concave bed, which is composed of iron, or of plank, about two inches thick, and forms about one-fourth of the circle of the cylinder. In this concave are fixed a number of thin bars of iron, which are about half of an inch wide, and four inches long, notched on their upper edges, and placed obliquely, so as to point from each side downwards and to the centre; thus the straw will pass much easier, and as it will incline towards the centre of the concave bed, it will be less liable to get between the ends of the cylinder and the sides of the machine, than in machines the bars of which are placed transversely on the concave."

"What I claim as my invention, and wish to have secured by letters patent, is the form of the bars in the concave bed, and the manner in which they are placed."

5. For a *Fly Net for Horses;* Henry Korn, city of Philadelphia, December 8.

The present patent is taken for improvements of the fly net patented by Mr. Korn on the 12th of September, 1829. It appears that specimens of the improved net are deposited in the patent office, but there is no drawing of it accompanying the specification. One of the specimens is referred to as No. 1, and we are told that the improvement in this part, which is the breast piece, consists in an alteration of the mode of attaching the end straps by buckles round the tug-eyes, &c. Now all this certainly might be represented in, and made clear by, a drawing; and the law absolutely requires it. The improvements, it is said, render the net more durable, more easily used, and more beautiful in its appearance.

6. For an improvement in the *Plough;* James Carothers, Shirleysburg, Huntingdon county, Pennsylvania, December 10.

The claims made are to the construction of the land side; to grooves in the mould board; to the manner of securing it to the land side; and to what are called regulators.

No particular form is prescribed for the mould board, but it is to be of cast iron, and to be provided with a groove, into which a corresponding part on the land side fits, and secures it in its place. The land side is to be of cast iron, and the angles which it forms with the other parts are particularly described. There are two parts called regulators, one of which is to supply any deficiency in the mould board from wear at the bottom, the other is a screw bolt used in fixing the parts together. This patent, therefore, like most of those taken for ploughs, is mainly for the manner of uniting its parts, and not in the principle of construction.

7. For a standing press, called the *Toggle Joint Screw Press;* Luke Hall, Hollis, Hillsborough county, New Hampshire, December 12.

In this press there are two toggle joints, which, when the pressure is taken off, recede from each other, and when it is to be exerted, are drawn towards each other until the compound bars of which each toggle joint consists stand in parallel lines. In order to draw them towards each other, the shaft of a strong screw passes through nuts properly fixed in the middle of each toggle joint, this shaft having a right handed screw at one end, and a left handed screw at the other, acts simultaneously on the joints to cause them either to approach or recede. The screw is to be turned by a crank, on the shaft of which there is a pinion taking into a wheel on the screw shaft, and capable therefore of operating upon it with vast power.

The claim is to the application of the right and left handed screw to the toggle joints, all the other parts being common.

The press, as represented, will certainly be a very powerful one, but we apprehend that there are but very few purposes to which it can be applied. The range of its platten will be small, and its action slow; and, for most purposes, these circumstances would entirely neutralize its good properties.

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8. For a *Machine for Hulling and Cleaning Clover Seed;* Alexander Matthews, Island Creek, Jefferson county, Ohio, December 13.

The external form of this machine is nearly the same with that of the wheat fan. The clover to be cleaned is put into a hopper, whence it is drawn by two fluted rollers, and delivered between two fluted rubbing boards, and thence between two cast iron rubbing plates, the contiguous surfaces of which are furnished with numerous fine teeth cast on them. The rubbing apparatus lies horizontally at the upper part of the machine, and below it are two sieves through which the seed and chaff are to pass on to a sloping board, where they are acted upon by a revolving fan. The whole apparatus is arranged on the same principle with several others, for the same purpose, and a claim to it must depend for its validity upon the construction, as specified. The claim is made to "the foregoing machine for the purpose of hulling and cleaning clover seed, or for any similar purpose to which it can be applied."

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9. For a *Washing Machine;* Miles B. Hand, Lockport, Niagara county, New York, December 14.

There are to be two reeded rollers running upon gudgeons in a frame within a trough. The gudgeons of one of the rollers run through the trough, and have a leather strap passing round them, and extending down to a treadle, by placing the foot upon which the roller may be made to revolve. A spring pole above, with a line descending from it, may serve to raise the treadle. The clothes are to pass to and fro between the rollers. The claim is to the using of two rollers only, and to the turning them in the way described.

We do not see any thing in this machine likely to redeem the character of the great family to which it belongs, and which is not in high repute.

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10. For a *Thrashing Machine and Horse Power;* John Lammon, Macedon, Wayne county, New York, December 14.

We are informed by the patentee that the improvement here made in the thrashing machine consists in the form of the teeth of the cylinder and the bed piece; and in allowing these two parts to recede from each other. The teeth are to be tapering, being about three-eighths of an inch in diameter at their lower ends, and terminating in a point. Their length is to be about three-fourths of an inch.

The horse power consists of a band wheel upon a vertical shaft, a strap from which turns a whirl on a second shaft, carrying another band wheel, the strap of which drives the cylinder of the machine. There may be novelty in each, but we have not discovered it.

11. For an improvement in the *Horse Shoe;* Lewis T. C. Smith, Scott county, Kentucky, December 15.

The upper side of this shoe is to be perfectly flat for some distance from the outer edge, when it is to be dishing or bevelled. The lower, or tread side, is to be raised to nearly a sharp edge along the groove which receives the nail heads. This is to cause it to take firm hold of the ground, and prevent slipping. These, and certain other points, which are particularized, constitute the claim. "All of which parts," the patentee says, "differ in principle materially, mechanically, and usefully, from any horse shoe known, or believed to be in use," &c.

12. For an improved *Fire Place and Oven;* Jonathan Knight, Stoddard, Cheshire county, New Hampshire, December 15.

It can scarcely be said that the present patentee has given such a description of his invention as shall "distinguish it from all other things before known or used; nor has he told us what kind of fuel is to be employed in his fire place, we suppose, however, that it is to be wood. The whole description is brief and perfectly general, without any claim, or any mode of expression which indicates the parts or arrangement that he considers as new. We are told that the foundation is to be of brick or stone; that the cap is to be of stone, or iron, with two circular holes in it for boilers, and a niche at the back part of it for heat and smoke to pass. The oven may be either of stone or iron. There must be suitable funnel holes to conduct the smoke from the niche; and a piece of sheet iron is to be placed in front, forming the upper part, or breast, of the fire place.

We have not given the foregoing for the purpose of affording a distinct view of the apparatus, as we do not possess this ourselves, even though aided by the drawing in the attempt to obtain it.

13. For a *Percussion Cannon Lock;* Samuel Ringgold and John P. Moore, of the city of New York, assignees of the inventor, Enoch Hidden, of the same place, December 16.

Several patents have been obtained for improvements in the percussion lock for cannon. Joshua Shaw, of Philadelphia, Lieut. Bell, of the U. S. army, Mr. Hidden, and Mr. Eastman, of Maine, are among the number of those whose inventions we have noticed. In the petition on the present occasion, it is said that the invention consists in the construction of "a percussion lock which is made to move horizontally, or by a side movement or motion of the cock, so as to admit the explosion from the vent to pass by without injury, and to be perfectly disengaged from the vent, the cannon and lock remaining in perfect security. The cannon, or gun, to be discharged by means of a primer, priming cap, or pellet, made of any of the percussion fulminating mixtures, of any convenient form." And in the specification the claim is made to "the horizontal or side movement or motion of the cock, to admit the explosion from the vent to pass by without injury to the lock or cannon."

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14. For a *Cheese Press;* John Crane, Hanover, Grafton county, New Hampshire, December 17.

This is called the self-pressing-hanging lever cheese press. It is called self-pressing because the power applied is only the weight of the cheese and that of the apparatus within which it is placed. The construction is ingenious, and the press may undoubtedly be made to operate well. There is a frame similar to that of the ordinary standing press, and a second frame is made which fits between the cheeks of the former, is about half its height, and will readily slide up and down within it. When this inner frame is raised, the two levers which operate in pressing the cheese, approach towards a horizontal position, and when the frame is lowered they are so constructed that they approach to a vertical position, and their shorter ends bear upon a board, or follower, placed above the cheese. An accurate description of it cannot be given without a drawing. There is no claim made, and as the whole arrangement is considered new, and we believe correctly so, it was not necessary to make any.

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15. For *Machinery for Washing Gold*, called the Rail-way-Car Gold Riddle; Oscar Willis, Burke county, North Carolina, December 21.

A riddle is to be prepared consisting of four pieces of timber which form the sides, and a bottom of sheet iron, which is to be perforated with numerous small holes. This riddle runs upon small wheels, the ways upon which they run forming a double inclined plane. When the auriferous gravel, or earthy matter, is thrown into this riddle, it is to be moved backward and forward by hand, one end of the riddle rising, and the other being depressed as it moves in each direction, in consequence of the inclination of the ways. Water is to be supplied which washes the gold, and other matters, through the holes on to a recipient below, whence it is conducted to a sloping trough, or ripple, with slats across it, which detain the gold, whilst the lighter parts wash over. The whole is claimed with the exception of the ripple. The patentee says that experience has proved the great value of this machine; there is nothing in its appearance, however, which would mark a superiority over several others previously in use.

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16. For a *Perpetual Rotary Oven*, for the baking of bread, crackers, &c.; J. L. D. Mathies, for himself, and as the assignee of James Mathies, deceased, Rochester, Monroe county, New York, December 21.

The main feature of this oven consists in giving to its inside the form of a vertical cylinder, with a vertical shaft in its centre, which supports a circular cast iron shelf, fitting the sides of the oven so nearly as but just to clear them as it revolves upon the shaft. If preferred, the circular shelf may rest upon rollers, and revolve without a shaft.

A door opens at the side of the oven, and when articles are to be baked they are placed upon the shelf, which may then be turned round, and thus covered, or discharged, without the necessity of reaching to the back of the oven. The oven may be made exteriorly of cast iron, and lined with brick.

The fire is to be made below, the upper part of the furnace, or fire place, forming the bottom of the oven, and flues from it are to carry up the heat, and conduct off the smoke.

Cooking fires may be constructed around it for boiling and other purposes, whilst the waste heat will go to warm the oven. Above the oven, a chamber may be constructed which will be heated in a lower degree, and will serve to keep articles warm which have been cooked. This heat chamber, we are told, may extend up into the dining room, whilst the oven is in the kitchen. The oven itself, it is proposed to make from two to five feet in diameter.

There are various flues, and other parts, described, and the claim is to "all the above improvements." The revolving shelf, however, is principally relied upon.

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17. For a *Cross-cut Sawing Machine;* James W. Messenger, Windham, Portage county, Ohio, December 21.

A cross-cut saw is to be fixed in a frame within which it is properly strained. This frame is made to slide backwards and forwards between the cheeks of another frame, furnished with the proper apparatus for giving motion to the saw. This last frame is furnished with dogs which are to be driven into the log, to hold it in its proper place. A shaft is to be turned by hand, upon which there is a toothed wheel, mashing into a smaller wheel having a crank upon the shaft which operates upon two pitmen which are to carry the saw frame. The pitmen do not draw against the frame, but each in its turn pushes against the inner sides of it, so that the action upon the saw may be similar to that produced by hand.

That such a machine can be made to produce the intended effect is not to be doubted, but we are by no means certain that its use will be advantageous. It will be too cumbersome to be managed by one man, it will take some time to fix it in its place, there will be considerable friction in its various parts, and the action of the crank without a fly wheel, will not be a good one when thus applied. Upon the whole, therefore, we err greatly in judgment, if two men, going on after the old fashion, will not perform better without than with this improvement.

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18. For a *Machine for letting in Wagon Boxes;* Orlando A. Fuller, Vernon, Oneida county, New York, December 21.

The tool described for letting boxes into the hubs of wagons, will, it is said, enable a man to perform ten fold the work which he can accomplish in the ordinary way. Although some pains have been taken in drawing up the description, it is still so obscure, even with the aid of the drawing, as to preclude our attempting any explanation of it. The model would probably remove this difficulty, but to this we do not think proper to resort, as it makes no essential part of the patent; a fact, the ignorance of which is a source of frequent error.

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19. For an improvement in the *Boilers of Steam Engines;* Isaiah Jennings, city of New York, December 21.

(See specification.)

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20. For an improvement in the *Coffee or Spice Mill;* Amasa Sizer, Cheshire, New Haven county, Connecticut, December 22.

This mill is intended to turn horizontally; but it differs, materially, in its construction from the ordinary horizontal coffee mill. The whole of it is to be made of cast iron. The lower piece, or bed, consists of a circular part which is convex, or conical, in the middle, and is cast with furrows, or teeth, as it forms one of the grinding surfaces. A rim projects up round the edge of this circular part, leaving a groove between it and the cutting surface, which groove is to receive the rim of the runner, which, with the bed, performs the grinding. The rim upon the bed piece serves to retain the ground material, until it arrives at a part where the rim is removed to allow of a lip, or spout, for its delivery. A projecting piece, or ear, attached to one side of the bed piece, and perforated with holes to receive screws, admits of the mill being firmly secured to a shelf.

The runner is a truncated, hollow cone, adapted to the projection upon the bed, and has a rim fitting into the groove before described. This is surmounted by the hopper, which is also a truncated cone, with its larger end upwards, as usual. The hopper and runner are to be fastened together by screws, and the crank, or handle, by which the mill is to be turned, is cast on to, and projects from, the upper edge of the hopper. In grinding with this mill, the hopper and runner, therefore, revolve together. A suitable screw confines the runner upon the bed piece, allowing it to revolve, and having a thumb screw under the bed piece, by which it may be tightened or regulated.

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21. For an improvement in *Stoves;* Powell Stackhouse, city of Philadelphia, December 22.

Instead of the usual construction, the oven part of this stove is to be made cylindrical, or oval, and to be double, there being one cylinder, or oval, within another, leaving a space between them which forms the flue surrounding the oven. After the heat and smoke have circulated around the oven, they escape by a pipe in the usual way.

The patentee says that whilst different kinds of fuel may be used in this stove, it is peculiarly adapted to the use of anthracite, as the heat is equally diffused around the whole oven.

There is no claim made, but the whole description goes to show that the patent is taken for the making the space between the oven and its case perform the office of a flue; in this, however, there is no novelty, as ovens have been, in numerous instances, so constructed. That described at page 231 is of this description, and we could refer to many others was it necessary so to do.

22. For improved *Bellows;* Luna Bishop, Readsborough, Bennington county, Vermont, December

The blowing is to be effected by vanes revolving in the manner of those used in wheat machines, and for other purposes. A circular drum is to be made, through which a shaft passes, carrying the blowing vanes. There are to be three channels formed by suitable partitions surrounding the vanes, and all leading to one air chest, from which a nozzle is to proceed to the fire. The circular drum is open around the revolving shaft to admit the requisite air. The patentee anticipates that the air will be forced through the nozzle of this bellows in a very condensed state; in this anticipation, however, we apprehend that he will be disappointed, for if much condensed, the very openings at which it is admitted would serve as vents for its escape.

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23. For an improvement in the *Cocoa Nut Cutter;* Daniel Fitzgerald, city of New York, December 22.

A wheel about an inch thick, and fifteen inches in diameter, is to be fixed to turn upon an axis like a grindstone; on one side of the wheel, from four to six irons are to be placed like those of a spoke shave, and there are to be perforations behind each of them through the wheel like the throat of a plane. A standard, or rest, rises from the base of the machine, and stands within an eighth of an inch of the cutter, and upon this the nut is to rest whilst it is being cut. Rows of points are also fixed upon the wheel near each of the cutters, and are made sharp to cut the cocoa nut. The claim is to "the knives and cutters on the wheel." We do not know in what way this operation has been heretofore performed, but are certain that there are machines in use for comminuting other articles very similar to that now described, and applicable to the same purpose.

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24. For a *Quilting Frame;* Brook W. Sower, Leesburg, Louden county, Virginia, December 23.

This quilting frame is essentially the well known tambouring frame enlarged, and placed upon legs. There are to be two rollers, one on each side of the frame, turning on gudgeons, and furnished with rag wheels and palls at their ends. A strip of list, or webbing, is fixed upon each roller, for the purpose of attaching the quilt.—A modification is proposed, which renders the rag wheels unnecessary. Holes are to be made around the ends of the rollers to receive pins, which resting against the frame, or other stop, will serve to secure them in their places.

We presume that the tambouring frames with their rag wheels and palls may still be used with impunity, but should the workman mistake the dimensions given, and make them large enough for a bed quilt, its use is fore (or rather *hind*) stalled, by this patent, the invention consisting in "the before described quilting frame, and the last described modification of the same."

25. For a *Washing Machine;* David Watson, Fayette, Kennebeck county, Maine, December 23.

A box or trough, has rollers fixed upon the bottom of it, extending across it, and forming, longitudinally, a segment of a circle. A vibrating frame, furnished with similar rollers at its lower end, is to be passed backward and forward over the clothes to be washed. So far this machine exhibits all the features by which a very numerous family is designated; but, in general, the gudgeons of the vibrating frame have rested upon spiral or other springs, admitting of its adaptation to the thickness of the clothes; in the present instance, the genius of invention has suggested a substitute for these springs, by putting pulleys on the upper ends of the standards which support the vibrating frame, allowing cords attached to the frame to pass over these, with weights on the ends of the cords which shall be a counterpoise to it. The patentee says, "What I particularly claim, and for which I ask an exclusive right, as my mode of suspending the rollers, is that above specified." We take the liberty of suggesting to the next improver of the washing machine, that a weighted lever, or, if he prefers it, two weighted levers, may be made to answer the same purpose as that which is to be effected by pulleys and ropes.

26. For a machine for *Netting Pine Apple Cheeses;* William Starr, Norway, Herkimer county, New York, December 27.

The cheese after being taken from the moat, or mould, is to be put into a net of suitable structure. The lower part of the net is to be fastened to an iron, or other strong bar, fixed across a frame; the upper end is to be fastened to another bar, which may then be raised until the twine of the netting properly indents the surface of the cheese; the ends of the bar are then to be slipped over pins which project from the frame, and it is retained in its place. The patentee says that "the cheese can be netted in this way with greater ease and expedition than by any other heretofore in use."

A patent was taken some time since for preparing the moulds of such cheeses so as to give the impression without netting; the pattern being carved or cast within the mould.

27. For an improvement in *Steam Boilers;* Philo M. Hackley, Herkimer, Herkimer county, New York, December 27.

The steam engine boiler which is the subject of this patent is to be formed of several vertical, concentric, double cylinders, closed at both ends; each of them is to be kept filled with water, and they are to be connected together by proper tubes; they are, generally, to be placed vertically upon the bars of the fire place; the heat and flame are to pass up in the spaces between these cylinders, and, consequently all of them but the exterior cylinder, exposed to its action on both sides. A metallic dome, somewhat convex upwards, covers the whole of the interior boilers, and is fastened to the edge of the inner plate of the exterior boiler. Above the first dome there is a second which is hemispherical; this is attached to the outer plate of the exterior boiler, and forms the top, or cap, of the whole. The water is to rise to a considerable height in the space between these two domes; this water communicates freely with that in the outer boiler, and this in its turn being connected with all the others, by water ways, the whole is to be considered as forming one boiler. It is proposed also to make the bars of the grate hollow, so as to be filled with water, and to connect them with the cylinders.

The foregoing is a mere outline of the general plan, it not being necessary here to notice the supply pipes, water and steam cocks, and other usual appendages to steam boilers, or to particularize the auxiliary contrivances which are described by the patentee; it is necessary, however, to the understanding of the claim, to state that it is proposed to cause the heat and flame to ascend spirally between the boilers, by means of a screw-like partition running up between them, which tends to support them, and likewise to preserve them in their concentric positions.

The claim is to the combination, in one boiler, of two or more cylindrical boilers, all united by tubes, or connected by one common cap; the resting of the inner cylinders upon hollow supporters, and the employment of water tube fire grates, connected with the boilers.

It appears to us that the above claims are too general, as concentric cylindrical boilers are not in themselves new, nor is it new to construct the grating of furnaces hollow, and connect them with the boiler; we apprehend, therefore, that the claim should have been confined to the particular arrangement adapted by the patentee.

Independently of the question of originality, that of utility presents itself as one of great importance, and from reasoning, as well as experience, we are led to the conclusion that boilers, bars, and tubes, constructed and connected like those described, will frequently fail in performing the duty assigned to them. The steam generated in bars and tubes will often exclude the water, and then the action of the fire will destroy them; this has frequently happened, and we do not perceive any thing in the present arrangement to secure this apparatus against the same fate.

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28. For an improvement in the *Caulking of Ships or other Vessels;* Nicholas W. Chevalier, city of Baltimore, December 27.

In the common mode of caulking, the seam between the planks is wedge-shaped, in consequence of which the caulking is apt to start, from the working of the vessel; to prevent this the patentee makes a groove, or hollow, on the edge of each plank; this is filled up by the caulking, which thus forms a tongue, retaining it in its place. The claim is to the forming of this groove.

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29. For an improvement in the *Plough;* John Deats, Roxburgh, Warren county, New Jersey, December 28.

This is to be a cast iron plough, consisting of several parts put together in a manner particularly described in the specification. We shall not attempt any description, but merely give the claim of the patentee, which is to "the before described improvements in the mould board; the main land side; the bottom land side; the cutter; the projection, or ear, on the share, and space in the same at the heel; the plate of iron under the share; and the dovetailed piece of cast iron in the end of the beam."

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30. For a *Machine for Sawing Furrow Boards;* Nathan H. Dearborn, Conway, Strafford county, New Hampshire, December 28.

The term furrow boards is new to us, and we are not able to learn from the specification the use to which they are to be applied; we perceive, however, that they are to be sawed winding, and that very considerably. There is to be a carriage, a saw frame, and a pitman, made in the usual manner, but the saw is to have a twist in the frame to correspond with the winding cut to be given to the log. The machinery by which this winding motion is given to the log is so constructed as to cause it to turn upon pivots as the carriage proceeds. This machinery is but imperfectly represented in the drawing, which is without written references; if well drawn, however, it is too complex to be made plain by verbal description alone. There is no claim, the general arrangement of the machine being considered as new.

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31. For machinery for *Propelling Mills, Vessels, Carriages,* and other machinery, by manual labour; Joseph G. Aldebert, Parish of St. Landry, Louisiana, December 28.

Whenever we meet with machinery for propelling machinery, we are instantaneously prepared to repel that invasion of the laws of nature of which such contrivances are almost uniformly the precursors. The idea of putting a man at one end of a machine, and placing between him and the other end a combination of wheels, pinions, and levers, which shall enable him to communicate the power of an elephant at the end of the train, is one which we have never had occasion to repudiate, because we never consorted with it, having in our first lessons in natural philosophy learnt its absurdity. So much for our *proem*, and now for the conclusion of the specification before us, in which we are told that "the lever or levers being worked up and down by the hand, or otherwise, push round the ratchet wheels by means of the rods from the levers to the projections, or arms, on the small wheels; the palls fall into the notches and connect the small with the large wheels, and thus force them round with them. One of these wheels works into the pinion, which gives motion to one of the fly wheels, the other being moved by the levers and bridles. The motion thus generated can be communicated, by proper gearing, to mills or any kind of machinery."

Those who have gone no farther on the road of mechanical inquiry than over the *pons assinorum*, will not need a more extended account of the means and ends of the patented machinery indicated by the foregoing article, to allay all further curiosity respecting it; with those who have not yet set out on the journey, or who have mistaken the road, we have not, at present, time to hold a long talk, and a short one would assuredly be waste of words.

32. For an improvement in *Making Ropes, Cords, Cables, Tow Lines, and Cordage in general;* Aaron Bull, Caroline, Tompkins county, New York, December 29.

The patentee of this improved rope has gone upon the correct principle that some of the metals are stronger than hemp, but we apprehend that in this instance he has failed in the attempt to apply the principle, or fact, to a useful purpose. He, however, is so brief in the description of his invention, that we can give the whole to our readers and still occupy but little space. Threads sufficient to form a strand are to be taken, and in forming it wire is to be laid in the centre of it so as to form the heart. After the several strands are thus prepared, they are to be laid together in the usual way.

We are not told what kind of wire should be employed, and are at a loss to say what will answer the purpose. Iron will rust, gold will be too dear, and most of the metals having but little tenacity, must be counted out. Even copper, the most promising of the family, will break by repeated bendings, and will not yield like the more elastic parts of the strand. We are really apprehensive that if any advantage be derived from this patent it will be confined to the wire drawer, and that the consequent increase of his business will be of but short duration.

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33. For an improvement in the *Skate*, and the mode of manufacturing the same; William Whitaker, city of Troy, Rensellaer county, New York, December 30.

The claim of the patentee will at once indicate the nature and merits of the invention, it is as follows:

"What I claim as new, and as my own invention, or discovery, in the above described skate, manufacture, or improvement, and for the use of which I ask an exclusive privilege, is the application, or use, of cast iron, or other metal, either separate or mixt, (which may be cast,) in producing, or forming, by the operation of cutting the said metal, or metals, entire skates, (excepting straps or strings,) each in one piece, without wood, joint or screw, pin or rivet, and so constructing the same as to combine in a sufficient degree, lightness, permanence, and strength."

The only objection to these skates, which we perceive, is, that being made wholly of a good conductor of heat, they will be much colder to the feet than those mounted in wood. We have no experience in the business ourselves, but have heard this complaint respecting skates mounted with sheet iron. Every horseman knows the difference in cold weather between keeping his feet in, and disengaging them from, the stirrup. With the exception of the circumstance mentioned, we apprehend that this skate is, in all points, a real improvement.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an improvement in the Boilers of Steam Engines. Granted to ISAIAH JENNINGS, *city of New York, December*, 1831.

To all whom it may concern be it known, that I, Isaiah Jennings, of the city of New York, have invented an improved mode of constructing boilers for steam engines, which improvement is particularly applicable to the boiler heretofore patented by me, but is also applicable to boilers of other constructions. The following is a full and exact description of the boiler as now constructed by me; not intending, however, to confine myself to any specific form or dimensions, but only to render manifest the principle upon which I proceed.

I usually construct my boiler with the exterior form of a cylinder standing vertically. This cylinder may be about twelve feet long, and three feet two inches in diameter. The interior of this boiler is in the form of a truncated cone, which will have the same length with the cylinder, and may be about two feet ten inches in diameter at the bottom, and ten inches at the top. A second conical part is also provided, of the same length with the former, but two inches larger in diameter throughout. These three parts are to be firmly connected together, both at top and at bottom, and between them is the reservoir for water and steam, and within them the fire and heated air passes. The top of the boiler, to which the cylinder and cones are secured, is perforated in the middle for a flue, and has the requisite openings for a steam pipe, valves, &c.

The larger cone is to be perforated with rows of holes at top and at bottom, to open a free communication for water and for steam between the exterior and interior spaces formed by the cones and cylinder. At the top, these holes may amount to a dozen, and half that number will suffice at the bottom. The row at top may be within an inch of that end, but those near the bottom had better be six inches from the lower end. I make them usually about one-eighth of an inch in diameter, and to preserve them from corrosion, and furring up, I usually bush them with gold, or platinum.

Besides the three parts above described, I cause a truncated cone of sheet metal to descend from the top of the boiler to the depth therein of about three feet; allowing about the same space between it and the larger cone as that between the two cones. By means of this, the steam which passes through the upper holes from the interior to the exterior space, is conducted down towards the surface of the water, which stands in the boiler at about two-thirds of its height.

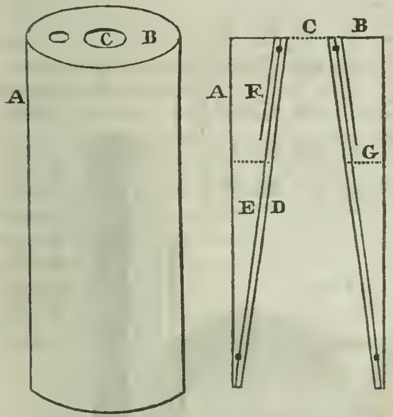
Should a boiler of this description burst, the rent will always take place in the interior, or smaller cone, which is exposed to the fire, and no where else. When such a rent does take place, no more water or steam can be suddenly discharged than that which is contained within the inner space, which upon fair and repeated trial has not been productive of the slightest personal injury. The smallness of the holes establishing a communication between the two chambers preventing any rapid discharge of the great body of water.

What I claim as new in the present arrangement, is the combining together of the three metallic vessels, so as to form two interior spaces, or chambers, for water and for steam, and the establishing a communication between these spaces, in the manner, and for the purposes herein described: intending to apply the same principle to such boilers now in use as will admit thereof, although they may differ greatly in form from that described.

I also claim as new, and as my invention, the bushing of the holes with metals not liable to corrosion.

ISAIAH JENNINGS.

Jennings' Boiler.



A, cylinder.

B, head.

C, opening for flue.

D, inner truncated cone.

E, larger truncated cone.

F, short truncated cone.

The dots on the larger truncated cone, at top, show the steam holes, at bottom, the water holes.

G, height of water.

ENGLISH PATENTS.

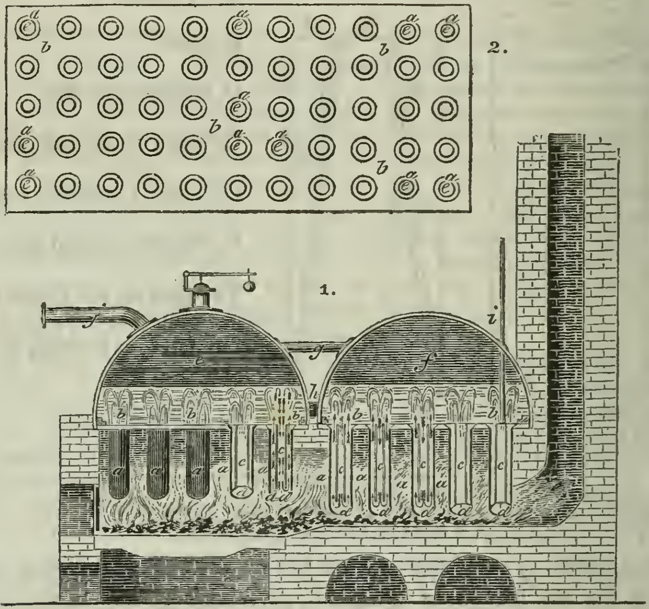
Specification of the patent granted to JACOB PERKINS, *of Fleet street, in the city of London, Engineer, for improvements in generating Steam. Dated July* 2, 1831.

To all to whom these presents shall come, &c. &c. *Now know ye*, that in compliance with the said proviso, I, the said Jacob Perkins, do hereby declare the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following description thereof, reference being had to the drawings hereunto annexed, and to the figures and letters marked thereon, (that is to say):—

My invention is that of a new method or methods of producing a rapid generation of steam, and consists in an apparatus that may be constructed with, or superadded, to the steam boiler or generator of steam; this apparatus may be considered as a lining to the internal surface of the boiler or generator, admitting the water to circulate between the two, by passages that are left open at the lower and upper parts of the lining, whereby the heat given off from the inner surface of the boiler, will be rapidly carried up to the surface of the water, and given off with the steam, and such boilers may have a higher degree of heat applied thereto without injuring the metal.

This invention may be more fully understood and carried into effect by the drawings hereunto annexed, which represent the apparatus as applied to three descriptions of steam boilers, by way of example; and I would observe that in each of these drawings, and the figures there shown, the same letters refer to similar parts.

Fig. 1.



Description of the Drawing.

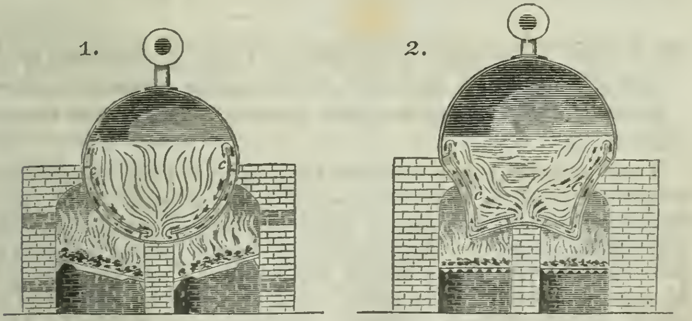
No. 1, Fig. 1, represents the apparatus applied to a boiler constructed with a number of tubes or compartments, descending from the main body, so as to come each into contact with the fire in the furnace, and thereby presenting a more considerable surface to the heat, as will be evident by inspecting this drawing. These tubes are denoted by the letter *a* respectively; the letter *c* represents internal tubes to the tube *a*, open at bottom and also at top; and these are the linings which constitute the invention or improvements. The inner tubes *c* rest on the inner area of the bottom of the tubes or compartments *a*, on the legs or supports *d*, which keep the inner tubes or linings *c* in their proper places, and leave a space all around as well as at the bottom, to produce the circulation more fully described hereafter.

This boiler is formed of two separate parts, *e* and *f*. No. 1, represents a cross section of the boiler, *g* being a steam pipe which connects the upper parts of the two, and is for the purpose of equalizing the steam therein; *h* is another pipe which connects the water, and keeps it on an equal level in the two; *i*, the water supply pipe; *j*, the steam pipe leading to the engine.

No. 2, Fig. 1, is the plan of the bottom of one of the parts or boilers *e* and *f*, showing the position of the tubes *a* and *c*. With respect to the other necessary parts of the boiler, which are known to every person acquainted with this sort of machinery; it is not deemed necessary to enumerate them, as they are not essential to explain the invention.

On lighting the fire in the furnace, the heat will strike against the outer surfaces of the tubes *a*, and thus give off heat to the water which is in contact with the metal, and such heated water will rise to the surface, and give off so much of it as is converted into steam, whilst the inner column of water contained in the tubes *c* will descend, and continue to fill up the space of that part which has become heated, and is rising to the surface; and thus will a very rapid circulation of the water take place in each of the tubes *a*, caused by the tubes or linings *c*, and by such rapid circulation, however great, the degrees of heat applied to the outer area of the tubes *a*, the rapid circulation will carry up the same, and give it off at the surface with the steam, and thus at all times keep the tubes *a* at a temperature which will not injure the metal, which would be the case were the inner tubes or linings *c* not used.

Fig. 2.



No. 1, Fig. 2, represents the section of a cylindrical steam boiler, such as is usually employed for high pressure engines; and No. 2 is a section of what is termed a wagon boiler, such as is used for low pressure engines. In each of these two figures I have not thought it necessary to show the construction of those boilers, more particularly, they being well understood, and in very general use, the only difference being the addition of the linings *c*, which are curved plates running from end to end of the interior surface of the boilers, but kept apart from each other at the bottom, to admit the passage of the water between them, and kept open and apart from the boiler at the top for the same purpose, such plates being kept to the positions shown in the drawings by means of short rods, which are rivetted or otherwise affixed to the sides of the boiler, and also to the linings *c*. The linings *c* are for the purpose of obtaining a rapid circulation of the water, as described with respect to No. 1.

In Nos. 1 and 2, Fig. 2, it will be seen that I use two separate fire places or furnaces, the object of which is, that the partition of brickwork which runs the whole length under the boiler, should prevent the fire acting under that part of the boiler, by which means the water over such brick-work always contains less caloric than that which is directly acted upon by the fire; and by the action caused by the partitions or linings *c*, a rapid circulation will be produced, which will take up the heat more quickly from the inner surface of the boiler, and give it off with the steam.

Having now described the nature of my invention, and having shown my improvements as applied to three descriptions of steam boilers, it will be evident from the nature of the invention, that the shapes of the boilers may be varied without departing from my invention, which I hereby declare to consist in applying the linings, *c*, by any apparatus, upon the principles and by the methods above described, for the purpose of obtaining a rapid circulation of the water in steam boilers or generators, and thus causing the water to take up the heat from the inner surface of such steam boilers or generators, and thereby producing a rapid generation of steam, with less injury to the metal or material of the boiler, as above described.

In witness whereof, &c. [*Rep. Pat. Inv*

To Andrew Ure, *county of Middlesex, Doctor of Medicine, for his having invented an apparatus for regulating temperature in vaporization, distillation, and other processes. Sealed 20th October,* 1831.

This invention is founded upon the principle of the compensation balances applied to chronometers, which are constructed of two or more long slips, or thin bars of different kinds of metal, connected together by rivets or solder; the several metals having different expansive properties under similar temperatures, and, consequently, by expanding when in connexion, bend or warp the compound bar out of its original form or figure. The apparatus is called a Thermostat.

The principle admits of being variously modified in its construction, and may be applied in many different situations, where a varying temperature can act upon it, for the purpose of becoming a self-moving agent. The intention of the patentee is to adapt this contrivance to distilling apparatus particularly, in order that by its expansion, or contraction, it may open or close a water cock, and thereby admit such a regulated current of the cooling fluid as shall at all times keep the materials under operation at a uniform temperature. The same contrivances are also applicable to regulating temperature in stoves and heating apparatus of various kinds.

The construction of the proposed apparatus admits of almost as many varieties as its adaptation; the patentee has exhibited several, merely as illustrations.

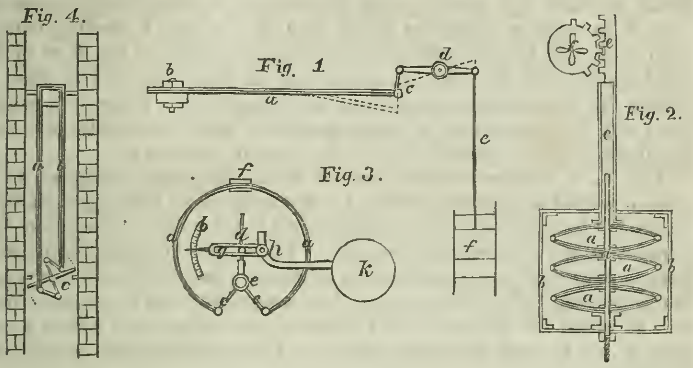


Fig. 1, shows one mode of applying the contrivance; *a*, is a bar, composed of two thicknesses of metal, brass, and steel, united, and made fast at the end *b* to the place where it is to be used, which may be called its fulcrum. At the reverse end, *c*, a link connects the bar to a lever *d*, which by the rod *e*, raises and depresses a sliding door or damper *f*.

When heat is applied to the compound bar *a*, it elongates, and that metal, which expands most under a given temperature, being uppermost, causes the bar to bend down, as shown by dots, and by that means to raise the door. If placed within a boiler, the same might open a cock or valve, and on the temperature being lowered, it would rise and close the cock or valve.

Fig. 2, is another modification of the contrivance, consisting of several pairs of compound metallic bows, *a a a*, connected together, the lower one of which is fixed by an adjustable screw to the bottom of the box *b*, and the upper one to a sliding rod *c*. The outer parts of these bows being composed of metallic bars, which are more readily susceptible of expansion by heat than the inner parts. On the temperature of the surrounding medium becoming increased, the bows rise upon the central pin *d*, and in so doing lift the rod *c*, which having a rack, *e*, at its end, turns the circular piece, *f*, upon its centre, and thereby opens a ventilator, or turns any other apparatus, by which a cool current may be admitted. When the temperature of the surrounding medium becomes lowered, of course the bows flat-ten, and come closer together, drawing down the rod *e*, and closing the ventilator.

Fig. 3, shows the thermostat in a circular form, that is, a hoop, *a a*, constructed by uniting two thin slips of dissimilar metals. At the open parts of the hoop two levers, *c c*, are attached by joints, and which levers are connected together, and to a sliding rod, *d*, at the joint *e*.

If this hoop, *a a*, be fixed at the part *f* in a vessel, the varying temperatures of which are required to be known, the different degrees of heat will cause the hoop to expand and contract, and in so doing to move the arm *g*, upon its fulcrum *h*, which will cause the cock *h* to open or close the water way of the pipe *i*, leading from a cistern *k*, and by that means to increase or diminish the flow of the cold water from the cistern, according as the heat of the fluid in which the thermostat is immersed may require it. There is a graduated arc, *l*, proposed as a thermometrical scale, to exhibit the temperature which is pointed out by the end of the arm *g*.

Fig. 4, is another modification of the contrivance, designed to be placed within a chimney or flue, for the purpose of opening a damper when the heat becomes too great; *a* and *b* are each a compound bar, composed of two dissimilar metals. These bars are fixed in pendant positions at their upper parts, to a stationary bar in the chimney, and when the heat of the flue causes the compound bars to expand, they will so move the levers at *c*, as to open the damper and admit a current of air to cool the parts within. This arrangement is called a pyrostat.

It must be repeated, that these are only illustrations of several construction's and modes of adapting the principle, but the patentee claims generally the adaptation of combined bars of metal, whose properties render their opposite surfaces susceptible of different degrees of expansibility, under any given temperature, for the purpose of moving levers, or otherwise operating to open or close valves, cocks, or registers, for regulating the temperatures of fluids, or airs, for refrigerating or ventilating. [*Lond. Jour.*

To William Mann, *county of Surry, gentleman, for his having discovered, or found out, that by the application of compressed air, power and motion can be communicated to fixed machinery, and to carriages, and other locomotive machines, and to ships, vessels, and other floating bodies. Sealed* 1*st June*, 1829.

From a perusal of the above curious title, it would appear that the patentee had no knowledge of the application of compressed air in the air gun, or of its adaptation in a thousand other ways, to obtain mechanical power; but even if it had not been known before, his having merely discovered, or found out, that by the application of compressed air power and motion can be communicated to fixed machinery, and to carriages, &c. &c. is not a discovery upon which a patent can be granted; because the discovery itself is not a vendable matter; whoever therefore, has dictated the title of this patent, has omitted that which should have been the very essential part of it, (viz.) that he has invented or discovered a *mode of compressing, or of applying* compressed air, &c. We take this opportunity of pointing out the fatal effects of an erroneous title, convinced that in the present instance, we are not, by the exposure, subjecting a new or useful invention to the jeopardy of legal consequence, and may perhaps be communicating a hint that will be found useful to future patentees.

The specification, which is extremely long, commences by telling us that atmospheric air may be compressed in close iron or other vessels by means of manual or animal labour, by wind mills, water mills, steam engines, and other means, and that when so compressed, the vessel containing the air may be conveyed from place to place, and may be stationed in any required situation: and the air may be let off from the vessel in small currents, and allowed to expand, so as to communicate by its elasticity a mechanical power capable of actuating, or impelling, machinery.

The common mode of compressing air, is by forcing it into a strong vessel, by means of an air pump, by which a large volume of air, at the usual density of the atmosphere, is taken and compressed into a small compass within the close vessel: the pumping operation being continued until the air within has reached that degree of density, or compression, required.

This the patentee proposes to do, by means of a series of air pumps connected together; the first pump compressing the air perhaps ten times, and the second ten times, bringing the condensation to a hundred times that of the natural atmosphere, and so on to any degree of density that may be desired. It is observed that this will not reduce the whole amount of mechanical labour requisite to bring the air to the same degree of condensation, by a single pump, but yet it is to be preferred.

There is to be a reservoir connected to each pump, to receive the air as it is forced in, and a valve to prevent its returning, from which reservoir the condensed volume is taken by the second pump, and still further compressed as we have said above. No drawings accompany the specification illustrative of the patentee's plans, but several elaborate tables are given, showing the required dimensions of the pistons and chambers of the series of pumps, diminishing in arithmetical progression.

When suitable, strong vessels have been thus charged with condensed air, the vessels may be conveyed to the situations in which they are to be employed for actuating or driving machines, and the compressed air being then let out from the vessel, in small quantities, into a receiver, is there allowed to expand to a certain volume or pressure, when it may be admitted into a working cylinder, for the purpose of raising or depressing a piston by its elastic force, in the same manner as steam is applied.

In this way it is proposed that condensed air should be employed as a power, in preference to steam, for driving locomotive engines and carriages, propelling vessels on water, and working machinery in general. Vessels containing this condensed air may be transported from place to place, like portable gas, for actuating lathes and other small machinery, where steam engines would be inconvenient; and the air, in its condensed state, may be conducted to any part of a manufactory by means of pipes, in the same way that Mr. Hague works his cranes at St. Katharine's Docks.* It is further proposed to employ this power in fortifications for discharging ordinance, by conducting the condensed air through tubes from a reservoir, to any part of the ramparts.

In order to obtain condensed air in large quantities, steam engines are to be employed to work the air pumps; or wind mills, water mills, and, in many cases, the tread mills of prisons may be made available for this purpose.

When the power is to be applied to locomotive carriages running from one town to another, steam engines should be erected, at not more than ten miles apart, to supply the vessels with condensed air as they become exhausted; and in the event of a line of locomotive carriages being established between London and Newcastle on Tyne, the surplus coal may be usefully employed in the neighbourhood of the collieries for producing steam to generate a power for condensing the air, and the vessels may be conveyed to different stations on the road, ready to be taken up for use. (See the specification of C. C. Bombas, for propelling, &c.)†

We presume that enough has been said in the above report to convey a tolerable notion of the scheme proposed by the patentee. It is not necessary for us to say another word as to the originality of the idea suggested, or of the practicability of the project; its obvious absurdity and uselessness must be perfectly evident.

[*Lond. Jour. March*, 1832.

Patent granted to ADOLPHE JAQUESSON, *of the county of Middlesex, Esq. for certain improvements in machinery applicable to Lithographic and other Printing. Communicated by a Foreigner. Dated July* 6, 1831.

THE patentee is not the inventor of this complex machinery. It comes from abroad. None of its parts are new, but for their original combination, and novel application, the patent is claimed. The machine itself will be found extremely useful: it is a printing press, whereon impressions may be taken from a steel or copper plate, a wooden block, a stone, or a form of type. Engraving, lithography, and printing, all by one process! There are a frame of strong angle iron, a sliding table, a cylinder, and the means of motion and communication.

The principle of the rolling press is evidently that which is here used. The table moves in grooves, or by a rail-road, and the cylinder is lifted up so as to justify its space to the different substances, from the copper plate to the block of stone. Proportionate weight is given, so as to regulate motion—into quick for utility, slow for excellence. Cog wheels and flies are the instruments of motion. Any power may be made to act. The motion of the table is horizontal, under the cylinder to receive the pressure, and back again to be inked. The action of the cylinder is, of course, rotary on its axis. The whole machine differs little from the usual rolling press: its great distinguishing feature being the power of elevating or depressing the cylinder, so as to allow it to act with regulated pressure on a thin substance, or on a thick one. The inking process is the same as that used in the usual presses. There is no doubt that (if the materials be reasonable, and the machine portable) it will be useful and popular.

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* Lond. Jour. 2nd series, vol. i. p. 95.

† Ib. vol. ii. p. 278.

Patent granted to Baron CHARLES WETTERSTADT, *county of Middlesex, for a composition or combination of materials for sheathing, painting, or preserving ship bottoms, and for other purposes. Dated July* 6, 1831.

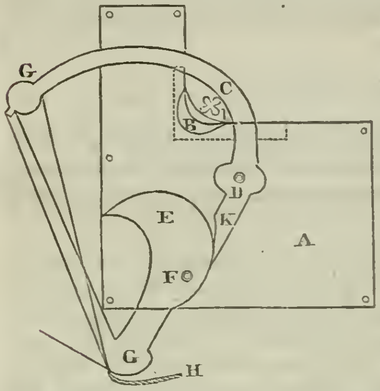
MR. WETTERSTADT'S "composition or combination" for sheathing ship bottoms, &c. consists of regulus of antimony and lead; 100 parts lead, and from three to ten per cent. of antimony, boiled, stirred and skimmed. When thoroughly combined, it is poured into cast iron moulds of sixteen inches, by eight and a half inches of superficies, and half an inch thick. The plates when cold are passed between rollers and flatted cut to sheets measuring thirty-four inches by sixteen inches. The next process is to paint these sheets with an amalgam composed of two parts lead, melted with one part antimony, and seventeen parts quicksilver, heated to 300° or 400° of Fah. [An ample latitude this, in an accurate detail of a specified process.] The amalgam to be stirred, and cooled down to the consistency of honey, when the sheets are to be painted with it; [no direction is given as to the portion of amalgam to be laid upon each sheet] and afterwards passed between the rollers as before, but in an opposite direction, and flatted out till they are from fifty-two to fifty-eight inches long, and sixteen inches wide. When the sheets are destined for the roofing of houses, and similar employment, the additional process just described is not requisite.

The *paint* for ship bottoms, paling, and other outside work, is composed of finely sifted dross and sulphur; equal parts of each melted together, and so carefully as that the sulphur may not take fire. The material is laid upon the ship, paling, &c. either by previously heating these, or by means of hot flat irons of such a temperature as not to fire the sulphur.

Mr. Wetterstadt states that his reason for confining himself to from three to ten parts of antimony, to the 100 parts of lead, in the composition of the sheathing, is, that the latter proportion would render the metal too brittle, and that the former quantity would be too small to produce the effect he requires: then why not state the exact proportion of antimony he deems the most beneficial to his purpose?

The patentee does not insist upon the employing of copper nails in his sheathing. [*Rep. Pat. Inv.*

Patent granted to William Batten, *county of Kent, for an apparatus for checking, or stopping, Chain Cables, which apparatus may be applied to other purposes. Dated July* 13, 1831.



The accompanying representation of Mr. Batten's invention is rather intended to convey a rough idea of its mode of operation, (which we could not do satisfactorily in words,) than a correct drawing as to the several proportions and accurate bearings of the machinery, for it was sketched from memory, after an inspection of the original drawing and specification.

The apparatus is intended to be fixed under the hatchway of the deck. The whole to be composed of wrought iron. A, is an iron plate; B, a thick boss of the same, over which the chain, or cable, I, runs; C, a lever playing upon a fulcrum D; E, an eccentric lever, moving upon its fulcrum F, and acting upon the second short lever K. The chain or cable I, is nipped, or stopped, altogether by the extreme ends of each lever being compressed by means of a rope that passes through the pulleys G G. And in order to set the chain or cable free the lever may be retracted by a short rope, H, fastened to the extremity of the lever E. [*Rep. Pat. Inv.*

On Bridges and Ferries.

A correspondent residing in Camden, South Carolina, has called our attention to the subject of bridges and ferries, referring to "the admirable account" of them "as constructed and used across the Rhine, in Dwight's Germany," and adding, that he "cannot but believe, with Mr. Dwight, that they would be worthy of adoption with us, and that the War Department would render service to the community by procuring the estimates of their cost, the detail of their practical value, and the principles on which they are conducted."

We subjoin the following extracts from Dwight's Germany, which, we believe, comprehend all that he has given to us upon the subject.

At page 11, speaking of the river Rhine at Mayence, he observes that it "is here a noble stream, and the only one I have seen in Europe which reminded me of the rivers in the United States. A bridge of boats is thrown across it, on which you pass with as much comfort as over those of stone which arch the Seine. This species of bridge, which I have never seen when travelling in my own country, is so simple, so cheap, and at the same time so convenient, that it is surprising we have never introduced it. It is composed of fifty-six boats well ballasted, that they may not yield too easily to the current, and which are anchored in a straight line, with chain cables. The force of the steam carries them down until they have let out all their length of cable, they are then parallel to each other, their bows being turned to the current. Large beams extend from boat to boat, and across them, at right angles, planks are placed. A bridge is thus formed in a few days. As winter approaches, it is taken to pieces to avoid the floating ice, and on the approaching spring it resumes its place again."

"My desire (he observes at p. 24,) of seeing Frankfort, and the beauty of the Rhine, induced me to return to Mayence. Between Cologne and that city there is but one bridge of boats, at Coblentz. There are, however, several moving bridges resembling our steam ferry boats in their construction, but much superior to them in one respect, that they are always in operation, and with no expense to the proprietor but the wages of the boatmen. A boat is anchored about half a mile above the ferry, in the centre of the stream; to this another is attached by a chain of twenty or thirty feet in length, and to this a third is united, and so on until the last chain reaches the ferry boat. The length of the chain connecting these is continually increasing. The first is anchored very firmly; the others are floating. The force of the current acting on them, and on the large one, is sufficient to carry it from one side to the other. Thus, without fuel or horses, they move from one bank to the other, with almost the same velocity as our team boats, and without any effort but moving the helm."

We have received, since the letter of our correspondent, the March number of the London Journal of Arts and Sciences, containing a communication on "Flying Bridges," which we have transferred to our pages as pertinent to the present subject. The mode of crossing ferries mentioned by Mr. Dwight has been sometimes used in the United States, and that referred to in the London Journal as having been used at Gravesend, in England, was for a considerable period employed on the Hudson river, opposite Troy, in the state of New York, where we have repeatedly crossed by its aid. Like many other old and well known contrivances, a patent was obtained for it, we believe, in the year 1808. Neither the width of the river at Troy, or the constant passing of vessels, admitted of the stretching of a rope above the water, as is practised at some ferries on the continent of Europe; it was allowed therefore to lie on the bottom, as at Gravesend. In order to preserve the proper obliquity of the boat to the current, it was connected to the block which runs upon the crossing rope, by means of two ropes, one from the stem, and the other from the stern; and by lengthening or shortening one of these, the head was made to point up the stream in crossing in either direction. There was a false keel to the boat, which was a plank of considerable width and made to turn upon a centre pin, so as to be readily shifted, so as to point more up the stream than the boat itself, and it was in fact upon this part that the force of the current was principally exerted.

Various circumstances concurred to induce an eventual abandonment of this mode of crossing. Occasionally, the rope parted and subjected the passengers to delay and inconvenience: this breaking of the rope was sometimes caused by its contact with the keel of one of the numerous vessels ascending and descending that river. Floating ice for a season interfered with its use, whilst the ordinary ferry boats could cross with facility. The tide also rises high enough to produce slack water at Troy, and this consequently interfered with the action of the boat, which is fitted only for places where there is a constant current.

We have said that this plan was patented, but of course, the patent, as such, was worthless. Another patent for a very similar contrivance was obtained by M. D. Brown, of Mason county, Virginia, on the 1st of October, 1830; we do not know, however, that this mode of crossing ferries is now in actual operation in any part of our country. When circumstances admit of their use, we apprehend that the swinging boats, or moving bridges, as they are denominated by Mr. Dwight, would be preferable to the crossing ropes.

We have said more upon this subject than we intended, designing merely to call to it the attention of those who are conversant with the subject; much has been published respecting it, the construction of floating bridges having been treated at length by writers on the military art; and it is well worthy of enquiry to ascertain to what extent, and in what situations, such can be advantageously constructed for general purposes; and also what mode of construction, under all circumstances, is the most eligible. [Editor.

On Flying Bridges.

To the Editor of the London Journal of Arts, &c.

Sir,—Flying bridges are rarely if ever used in this country, because whenever there is any intercourse between the opposite banks of a river, it is generally sufficient to justify the erection of a permanent bridge, and the breadth of our rivers is not in general such as to render the construction of permanent bridges impracticable; moreover, where they are broad, they are seldom rapid enough to prevent a ferry boat from crossing with tolerable ease and expedition.

From their simplicity and cheapness, and the expedition with which they can be constructed, flying bridges are of great use in military operations; they are also very common on the broad and rapid rivers of the continent, and although little used in England, are not undeserving of attention.

A flying bridge is formed by fastening a floating body to the end of a cable or chain, moored in a river, and keeping the body by a rudder, oblique to the direction of the stream; the action of which against the oblique side of the floating body, drives it away towards one of the banks, moving it in an arc of a circle, about the moorings of the cable.

Fig. 1.

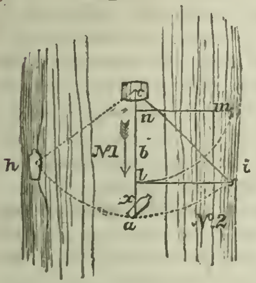


Fig. 2.

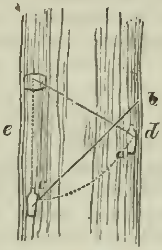


Fig. 3.

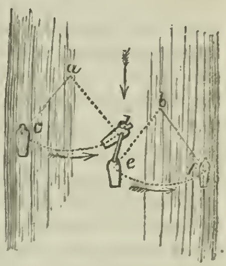


Fig. 1 represents a floating bridge; *a*, a boat fastened by a cable *b* to a buoy, or an anchor, at *c*. The current running in the direction of the arrow No. 1, moves the boat *a*, in an arc of a circle about *c*, away from the bank *h*, towards the bank *i*.

The force which urges the boat *a*, in the direction *h*, *i*, depends upon the obliquity of the boat to the current, and is greatest when the side *x*, makes with it an angle of 54° 44′.*

A bridge of this kind is in use on the Rhine, for crossing opposite Nymuegen. From the bank opposite to Nymuegen, a bridge of boats is built, extending rather more than half across the river. The flying bridge is a platform, or piece of road, laid on a strong barge, to which one end of a chain is made fast; the other end of the chain carried over and fastened to the masts of seven boats, to support its weight, and is moored in the river at some distance up the stream. The barge is steered oblique to the stream, and according to the direction of its obliquity, swings round in an arc of a circle, from the end of the bridge of boats to a jetty on the Nymuegen bank, or *vice versa*. The stream runs about three, to three and a half, miles an hour.

In very rapid rivers, flying bridges should not be made both to cross and recross by the action of the current; for the resistance to the motion of the boat in the ascending part of the arc (viz. in the direction of the arrow, No. 2,) is very great, and the descending force of the stream, to drive the boat down the river, negatives the effect of its oblique action on the boat, to drive it upwards about the moorings of the cable.

In such cases, it is adviseable to make the flying bridge move only one way by the current, viz. in a descending arc, and to haul it back by a second cable; thus the boat *a*, fig. 2, crosses to the bank *e*, through a descending arc from the bank *d* to *e*, taking with her a rope *b c*, by which she is hauled back from *e* to the bank *d*.

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* Vide Douglas on Military Bridges, p. 94.

On the other hand, a flying bridge will not act well in a river with a very slow current at the sides, unless jetties or bridges of boats are built out from the banks, some distance into the river, for the flying bridge to come up to; for when the current at the sides is slight, it will not carry the boat close up to the shore.

A flying bridge was established a few years ago across the *Kistna*, in India: the breadth at the part where the bridge was made is between 700 and 800 yards in the rainy season, when the river is full, and the stream then runs in the middle of the river, at about four, to four and a half, miles per hour. The bed of the river is deep, but the sides shelve up. In the rainy season, when the river was quite full, the flying bridge acted very tolerably, but when the waters were out, the strength of the current at the sides, owing to the extreme shallowness of the water, was insufficient, and the flying boat could not be made to come up to the banks within about forty yards.

When a river is too wide for a simple flying bridge, two boats may be used, one moving in an arc *c d* fig. 3, about the centre *a*, and the other in an arc *e f* about *b*, and a boat or a raft moored in the middle of the river, for shifting the passengers from one boat to the other. Or the raft may be dispensed with, and the cables shifted when the boats come close up to each other; the boat *d* being then made fast to the cable *b e*, and the boat *e* to the cable *a d*, so that each boat will go across in two stages from one bank to the other, through *c d* and *e f*.

Sir H. Douglas recommends this plan, in preference to having a raft in the middle;* we apprehend it might be attended with more danger of the boats fouling and doing injury, if the current were very rapid, for both boats would be moving at their greatest speed, just where they would meet, viz. in the middle of the river; and hence the shock, if by accident they were to strike each other, would be twice as great as the shock of one boat against a stationary raft. Also the difficulty of managing them in a rapid current, to change the cables, would be considerable, and the operation tedious.

We are not aware whether this plan has been extensively adopted in practice. The other is adopted in effect, and answers very well in the Nymuegen flying bridge; for though it has not two boats, the flying boat comes up to the stationary end of the bridge of boats, nearly in the strongest part of the stream.

In flying bridges, the cable should be of a good length, for when it is long, the flying boat moving through the arc of a large circle, has to ascend the stream less than when the cable is short; that is, its direction is nearer to a straight line across the stream, and, consequently, less of the effective force of the current to impel the boat across, is abstracted by the resistance of the current to the ascent of the boat. For instance, in fig. 1, with the cable *c a*, the boat moves upwards, equal to a distance *a l;* but if the cable were only as long as *c l*, the boat in crossing would move through a distance *l n*, against the stream, which is much greater than *a l.*

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* See Douglas on Military Bridges.

The whole motion of the flying boat from side to side, should not exceed a right angle, and then the angle *a c s*, fig. 1, will not exceed 45°; for when the angle *a c s* exceeds 45°, the force *c l* that impels the boat sideways, in opposition to the current, becomes less than the force *l s* which holds it to the centre. This is shown by the triangle *c n m*, fig. 1, where the angle *n c m* is more than 45°. The force *n m* is greater than the force *c n*, and the boat would not, in fact, rise by the oblique action of the stream so far as *m*.

In narrow rivers, not exceeding two hundred yards in width, and with a tolerably rapid current, a flying bridge may be applied with effect, in the following manner:

Let a cable be stretched across the river from bank to bank, and attached on each side to a frame secured in the bank, and drawn tight by a windlass; then attach the flying bridge to this cable, by means of a short rope, with a running block on the cable, and by keeping the boat in an oblique direction to the course of the stream, it will be carried across by the force of the current with considerable effect and expedition. This mode of establishing a flying bridge is more easy of adoption than the former one, and is attended with far less expense and trouble, as the buoys for the support of the cable may be dispensed with, and also the anchor for mooring it in the river.

This plan was used to establish a communication across the Thames at Gravesend, during the threat of invasion from France. The cable was suffered to sink to the bottom, not to interrupt the navigation, and as the boat crossed, the rope rose to the point of suspension on the bank.

The cable should not be sunk when it can be avoided, because the boat has then to move the weight of the rope that connects it to the cable; and, moreover, the running block will run with a great deal more friction upon the wet cable than when it is out of the water.

A triangular raft may be floated over a river, as well as a boat, if it be connected to a warp, or to a moored cable, in any of the ways we have described, by keeping one of its sides oblique to the direction of the stream.

Another mode has been found to answer well, viz. anchor the cable in the middle of the stream, and pass it over a pier of wood or masonry, built in the river, to the flying bridge on the opposite side of the pier. The bridge is then carried across the stream, if kept oblique to it, by the force of the current acting against its side, without the necessity of using buoys or boats for supporting the cable, which, at all times, tend greatly to impede the motion of the bridge, because the current acts upon them in an opposite direction to that in which it affects the flying bridge itself, and the latter has therefore, in effect, to drag the buoys through the water, against a considerable resistance.

When a river exceeds two hundred yards in width, it is necessary to adopt the mode of mooring the end of the cable in the stream, and passing it over buoys, or a pier to support its weight; but where a river is less than two hundred yards wide, the system of causing the flying bridge to traverse the river on a cable stretched across it from bank to bank, may be considered as far preferable in every respect.

P.

Prevention of Falsification of Written Instruments.

The attention of the French government has long been directed to the possibility of finding some means of preventing writing being chemically discharged from papers and other documents, either for the purpose of falsifying the contents, or for making a second and fraudulent use of old stamps. With this view the Academy of Sciences was directed to take the subject into consideration, and a committee, consisting of MM. Gay Lussac, Dulong, Chaptal, Deyeux, Thenard, D'Arcet, Chevreuil, and Serullas, was appointed for the purpose. The attention of the public was called to the subject, and a great number of specimens of ink, alleged to be indelible, were forwarded to the committee. Numerous experiments were made, and on the 30th of May, and 6th of June, the report was read to the Academy by M. D'Arcet. It is unnecessary for our purpose to follow the reporter through his elaborate history of the different manufactures of ink in different ages, or the detail of the experiments made with the various samples submitted to the committee; it is sufficient to state the conclusions which were unanimously adopted as the results of the investigation. These were, that the falsification of written documents will be fully prevented by the use of ink prepared in either of the two following manners: 1. Indian ink, (or in its absence the imitation of it made in Europe with soot and animal glue or gum) dissolved in a mixture of water and muriatic acid, of the specific gravity of 1010, (1½ degrees of Beaumé's instrument.) This ink may be prepared for four pence English per quart. 2. To a solution of acetate of manganese, of the specific gravity of 1074, (10 degrees of Beaumé,) add half its volume of solution of carbonate of soda crystallized, saturating it at about 166 per cent.: dissolve India ink in this liquid, and writing traced with it will become perfectly indelible on being exposed to the action of the vapour of liquid ammonia. The committee lay down, as a general principle, that no ink, kept in a liquid state, can be indelible, as the colouring matter, from its excess of density, will necessarily be deposited. Additional security will be obtained by writing on paper so prepared, that even if the ink could be discharged, it would necessarily be seen that it had been so discharged. Thus, M. Coulier proposes a paper, having printed on each sheet, lines and patterns, so complicated, as to defy forgery, and struck off from a steel plate damasked with aquafortis. The ink with which this is printed would be discharged by chlorine, so that the superjacent writing cannot be destroyed without also destroying the drawing. The plan is excellent for bills of exchange and other small documents; but from the expense and delay occasioned by the engraving and printing, the designs would be ill adapted for legal proceedings and public documents. M. Chevallier proposes a paper coloured in the pulp with colours liable to be discharged by all the known re-agents, but this might easily be recoloured when the alteration is made. M. Maimu suggests adding to the pulp of the paper filaments of wool, cotton, or hemp, dyed of different colours, some of which will be acted on by the acids, and others by the alkalies, but all liable to be discharged by chlorine. When these colours are discharged, it is almost impossible to restore them; but the writing may, in some cases, be effaced without any sensible alteration in the colour of the filaments; and on the other hand that colour will frequently change by simple exposure to the air, without any re-action being used. Mr. Coulier's method is by far the best, but has the disadvantage, that all designs easily dischargeable from the papers may become injured by time or accidental circumstances; a consideration which, in cases of forgery, would tend to render probable the impunity of the guilty by the fear which would be entertained of condemning the innocent. The use of these prepared papers must therefore be considered as very secondary, the main security must be found in the indelible inks. The discharge of the writing from old stamped documents, and the consequent fradulent use of the stamp, may be prevented. 1st. By printing on all stamped paper, by means of a cylindrical press, an engine-turned vignette, placed on the right of the stamp, in the centre, and along the whole length of each sheet. 2nd. By employing, in printing these vignettes, a colour having for its base the black precipitate formed in the dying coppers of hatters, or ink thickened in the manner adopted in the manufactories of painted cloths. And 3d. By marking on all stamped papers, the date of their fabrication, either by printing it in the pulp, or engraving it on the vignette or the stamp; or, more simply still, by making the dry stamp, impressed on each sheet of paper, revolve, so as to affix a new date each year. This report was ordered to be transmitted to the Minister of Justice.

[*Jour. Royal Ins.*

Blue extracted from the Stalk of Buck-Wheat.
(*Polygonum fagopyrum.*)

A BLUE colour, serviceable for dying, may be extracted from buck-wheat, in the following manner:

The stalks are cut before the grain has become mature; they are spread out upon the earth, exposed to the sun, and suffered to remain till the grain separate with facility. When this has been effected, the straw is collected, wetted, and allowed to ferment until decomposition take place, and the heap have assumed a blue appearance. It is then formed into balls, or cakes, and dried by the sun, or in a stove. These masses being boiled in water will impregnate it with a deep blue, which neither vinegar nor sulphuric acid will discharge. Alkalis will change it to a red; the powder of nut-galls reduce it to a perfect black; and, by evaporation, it will become a beautiful green. Stuffs dyed with this preparation, and by the usual method, take the dies from other vegetable substances; the blue is very beautiful, and the colour stands well.

[*Jour. Etrangers.*

Transport of Edifices.

On the 2nd of May, M. Gregori alluded to a circumstance mentioned in a late number of the Journal des Artistes, of a rock of granite, forty-two feet long and twenty-seven high, having been transported from the bay of Finland to St. Petersburg, to serve as a pedestal to a statue of Peter the Great. He stated that a much more remarkable fact had occurred at Crescentio, in 1776, when a common mason, named Serra, succeeded in transporting a brick belfry, which he had contrived to cut from its base without injuring the walls, from one church to another, at a considerable distance. While it was being moved, a man inside rang the bells. A model of the machine employed in the transport, was deposited in the library of the institute.

[*Proceed. of Roy. Acad. of Sci. of Paris.*

Protoxide of Copper.

The simplest and easiest method of obtaining protoxide of copper is the following:—Dissolve the copper in muriatic acid, to which small portions of nitric acid are to be added; afterwards evaporate to dryness, and heat the chloride obtained to its fusing point. It is thus converted into brown crystallized chloride. It is afterwards to be fused, ten parts with six of dry carbonate of soda, in a covered crucible, at a low red heat. The mass is to be treated with water, to dissolve the common salt formed; the protoxide of copper separates in the state of an uncrystalline powder of a fine red colour, which is to be washed and dried.

If muriate of ammonia be added to the above mixture, all the chloride is reduced, as will readily be foreseen, to metallic copper, which separates in a very divided and spongy state, when the mass is dissolved in water. [*Phil. Mag.*

Means of preventing Incrustations in Steam Boilers.

M. Ferrari has announced to the Royal Academy of Sciences of Turin, that he has observed that charcoal in coarse powder prevented incrustations from forming in the boilers of steam engines, and detached them when they have already formed.

[*Jour. de Chimie Médicale.*

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